United States Department of Agriculture

Animal and Plant Health Inspection Service

In Cooperation with

USDA's Forest Service

and

United States Department of the Interior

Bureau of Land Management

April 1994

Animal Damage Control Program

Final Environmental Impact Statement

Volume 2 of 3

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Issue date: April 1994

United States Department of Agriculture

Animal and Plant Health Inspection Service

P.O. Box 96464
Washington, DC
20090-6464

March 17, 1994

Dear Reader:

Enclosed is the final environmental impact statement (FEIS) assessing the impact of the Animal and Plant Health Inspection Service, Animal Damage Control (ADC) program.

This FEIS on the ADC program is provided for your information and review. The Record of Decision will be prepared considering the comments received and documenting the final decision of the Agency thirty (30) days after the Notice of availability in the Federal Register.

All comments will be considered as part of the decisionmaking process.

A copy of the FEIS is being sent to all persons who provided comments on the draft (1990), the supplement (1993), or to anyone requesting a copy. Please address written comments or requests for additional information and/or copies of the FEIS to:

William H. Clay, Director
Operational Support Staff
USDA, APHIS, ADC, Room 820, FB#1
6505 Belcrest Road
Hyattsville, MD 20782
(301) 436-8281

Sincerely,

Lonnie J. King

Lonnie J. King
Acting Administrator

Enclosure

Animal Damage Control Program
Final Environmental Impact Statement

United States Department of Agriculture
Animal and Plant Health Inspection Service

In cooperation with

United States Department of Agriculture
Forest Service
and
United States Department of the Interior
Bureau of Land Management

Location:

The 50 States of the United States, its territories and possessions

Responsible Officials and Agencies

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This Environmental Impact Statement Made Available

April 1994

Prepared By:

United States Department of Agriculture
Animal and Plant Health inspection Service
Washington, DC

Abstract

USDA conducts an animal damage control program that employs an integrated pest management approach to prevent or reduce wildlife damage to agriculture, natural resources, facilities and structures, and for the safeguarding of public health and safety. This programmatic EIS examines 13 alternatives and provides detailed analyses of the No Action Alternative, Current Program Alternative, Nonlethal Control Program Alternative, Nonlethal Before Lethal Control Program Alternative, and Damage Compensation Program Alternative. The analyses focus on the wildlife species affected, losses associated with wildlife damage, societal values or attitudes, and impacts on biological, economical, and physical aspects of the human environments. The Current Program Alternative, which uses an integrated pest management (IPM) approach to address wildlife damage problems, is the preferred alternative.

Animal Damage Control Program

Final Environmental Impact Statement

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United States Department of Agriculture
Animal and Plant Health Inspection Service

United States Department of Agriculture
Forest Service

United States Department of the Interior
Bureau of Land Management

Readers Guide

Animal Damage Control Program Environmental Impact Statement

Readers Guide

This final Environmental Impact Statement (EIS) documents the analysis of the U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), Animal Damage Control (ADC) program for the protection of American agriculture, natural resources, and facilities and structures, and the safeguarding of public health and safety. The EIS follows the format recommended by the President's Council on Environmental Quality (CEQ). Most EISs evaluate new projects, such as power plants or water impoundments. However, this EIS addresses an ongoing program of wildlife damage management. The intent is to analyze the impacts associated with the full range of wildlife damage control activities included in the Federal/Cooperative APHIS ADC program. This final EIS also analyzes the impacts associated with alternatives to the current APHIS ADC program.

The Readers Guide is provided to help orient readers and guide them through the document. The following guide shows the structure of the EIS and summarizes what the reader can expect to find in individual chapters. A brief Readers Guide also is provided at the beginning of each chapter.

A quick preview of this EIS can be obtained by reading the following:

- Summary.
- Introduction to Chapter 1 for an understanding of the decisions to be made.
- Table 2-2 for a comparison of the current APHIS ADC program, including direct control and technical assistance through an Integrated Pest Management (IPM) approach (APHIS' preferred alternative), and other selected alternatives.
- Table of Contents to Chapter 3 for an overview of the affected environment.
- Table 4-42 for a summary and comparison of the impacts of the alternatives.

The appendices provide information on the development of this final EIS and more detailed technical data, procedures, and material than are presented in the body of the document.

Volume 1
Summary

Provides a condensation of the document.

Volume 2
Chapter 1: Purpose and Need

Provides an overview, including:

- Decisions to be made
- Background and history of Animal Damage Control (ADC).
- Legal authorities, laws, and regulations
- The National Environmental Policy Act (NEPA) process
- Interrelationships
- Requirements for further analyses

Readers Guide

Chapter 2: Proposed Program Alternatives

Provides information pertaining to:

- Development of alternatives
- Current APHIS ADC program
- APHIS ADC Decision Model for Wildlife Damage Management Methods
- Other alternatives
- Comparison of alternatives
- Preferred alternative

Chapter 3: Affected Environment

Discusses those aspects of the human environment that are potentially affected by the alternatives described in Chapter 2, including:

- Protected resources, such as crops, livestock, facilities and structures, and public health and safety
- Target and nontarget wildlife and threatened and endangered species
- Economic environment
- Sociocultural environment
- Physical environment

Chapter 4: Environmental Consequences

Provides an analysis of the alternatives discussed in Chapter 2 and the effects on the environment discussed in Chapter 3. The consequences are presented as:

- Impacts of the five alternatives on the biological, economic, sociocultural, and physical environments
- Impacts of protecting crops, livestock, facilities and structures, and public health and safety on species abundance and diversity
- Direct, indirect, and cumulative impacts
- Unavoidable impacts and irreversible and irretrievable commitment of resources
- Comparison of impacts by alternatives

Chapter 5: Mitigation Measures

Discusses mitigation measures that potentially reduce impacts. These include:

- Standard operating procedures currently used in the APHIS ADC program
- Mitigation measures
- Monitoring and evaluation

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Chapter 1

Purpose and Need

Readers Guide

Chapter 1: Purpose and Need

Provides an overview, including:

- Decisions to be made
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Chapter 1

Purpose and Need

Table of Contents

A. Introduction

Wildlife generally is regarded as providing economic, recreational, and aesthetic benefits (Decker and Goff 1987), and the mere knowledge that wildlife exists is a positive benefit to many people. However, wildlife may also be responsible for negative impacts. The activities of some wildlife result in economic losses to agriculture and damage to property. Human safety is jeopardized by wildlife collisions with aircraft and automobiles, and wild animals may harbor diseases transmissible to humans. Predation by, or to, wildlife species that have special status, such as threatened or endangered species, is a public concern. Some types of wildlife are regarded as nuisances in certain settings.

Sensitivity to varying perspectives and values is required to manage the balance between human and wildlife needs. In addressing conflicts, wildlife managers must consider not only the needs of those directly affected by wildlife damage but a range of environmental components as well. Each conflict situation is unique; therefore damage management strategies must be selected in consideration of a variety of biological, economic, physical, social, and legal factors. The responsibilities and authorities to manage the varied wildlife damage problems are shared by governmental agencies and private entities. The U.S. Department of Agriculture (USDA) is directed by law to protect American agriculture and other resources from damage caused by wildlife.

The USDA, Animal and Plant Health Inspection Service (APHIS) proposes to continue a national Animal Damage Control (ADC) program to meet the need for wildlife damage management. This action is intended to address the diversity of wildlife damage problems nationally, by providing safe, effective, practicable, and environmentally balanced wildlife damage management services. This final Environmental Impact Statement (EIS) assesses alternatives to carry out the proposed action. Accordingly, this chapter provides an expanded discussion of this purpose and need, and identifies the kinds of National Environmental Policy Act (NEPA) documentation that will be undertaken in the future.

B. Decisions to be Made

The decision to continue this national program constitutes a major Federal action; therefore, APHIS is required by NEPA (Public Law 91-190, 42 U.S.C. 4321 et seq.; 83 Stat. 852), as amended, to assess potential impacts of the proposed action and possible alternatives. This assessment is documented in this final EIS, and together with supporting documents, considerations, data, and public comments, will be used by the APHIS Administrator to select the programmatic alternative and associated mitigation measures to be implemented.

The results of these decisions will be documented and made available as a Record of Decision prior to the implementation of the selected alternative. APHIS will monitor the selected alternative to ensure that program impacts are appropriately mitigated and that the program is meeting its objectives in compliance with applicable laws and policies.

C. Background

1. Wildlife Management

The science of modern wildlife management includes making decisions and taking actions to manipulate the structures, dynamics, and relationships of wildlife populations, habitats, and people to achieve specific human objectives by means of the wildlife resource (Giles 1978). Although professional wildlife management in North America generally is considered to have evolved during the 50 years since the 1933 publication of Aldo Leopold's Game Management (1933), wildlife management has in fact been practiced in one form or another for a much longer time.

Habitat modification was conducted by North American Indians through deliberate burning of grassland to enhance big game populations (Pyne 1982), and wildlife damage control was practiced by native Americans to prevent damage by blackbirds (Berryman 1983). Early settlers controlled damage to their crops and livestock and provided for their personal safety through exclusion and killing of wildlife. Game laws were passed in New Netherland in 1629, Massachusetts Bay in 1647, and New Jersey in 1678 (Cameron 1929). The first bounty law was passed in Massachusetts in 1630 (Cain et al. 1972).

Wildlife laws were largely restricted to game protection and perpetuation of hunting until the Seventeenth American Game Conference in 1930, when recognition was given to the marriage of wildlife and land management. The American Game Policy was produced stating the basic requirements of wildlife and its management: habitat, landowner incentives, classification of game species in relation to range requirements, and the need for

Like other wildlife species, raccoons may have either positive or negative impacts on humans.

facts, skills, funding, and public-sportsman cooperation (Gilbert and Dodds 1987). The subsequent book, *Game Management* (Leopold 1933), established the basic principles of wildlife management that continue today and recognized the legitimate use, both consumptive and nonconsumptive, of most wildlife species by humans.

Wildlife is a renewable natural resource and is managed accordingly. Management may be directed toward preservation of species, maintenance of animal populations for both harvest and nonharvest purposes, and control of excess nuisance species (Wolfe and Chapman 1987). Such actions include management of animal populations, their habitat, or both. This may be accomplished through regulatory mechanisms, technical assistance, or direct actions. The continued well-being of humans and wildlife is dependent on a diverse, functioning environment sustained through skilled and responsible management of resources (The Wildlife Society 1990a). The diversity of biological organisms and systems, including human needs and requirements, is an important consideration in professional wildlife management decisionmaking. Carefully planned, knowledgeable, and flexible management is required to ensure appropriate diversity is attained (Berryman 1991).

Wildlife management decisions are not predicated solely on biological rationale. Varying human needs place continually changing demands on the environment, wildlife resources, and, consequently, on wildlife management professionals. Special interest groups with conflicting social and economic goals exert political pressures that affect wildlife management decisions (Wolfe and Chapman 1987). Therefore, wildlife managers require knowledge and skill not only in the principles of biology and ecology, but in sociology, economics, and political science as well.

Responsible wildlife management requires adherence to professional standards as exemplified by objectives of The Wildlife Society, a professional, nonprofit organization dedicated to the wise management and conservation of the wildlife resources of the world. These objectives are to develop and promote sound stewardship of wildlife resources and the environments upon which wildlife and humans depend; undertake an active role in preventing human-induced environmental degradation; increase awareness and appreciation of wildlife values; and seek the highest standards in all activities of the wildlife profession (The Wildlife Society 1990b).

2. Wildlife Damage Management

In the United States, wildlife is a publicly owned resource held in trust and managed by State and Federal agencies. Government agencies have a mandate to provide for the welfare and perpetuation of wildlife and must be responsive to the desires of various groups while considering potential socioeconomic conflicts (Wolfe and Chapman 1987). Agencies must also respond to requests for resolution of damage and other problems caused by wildlife. Wildlife damage management, or control, is defined as the alleviation of damage or other problems caused by or related to the presence of wildlife. It is an integral component of wildlife management (Leopold 1933; Hawthorne 1980; Berryman 1983, 1989; Timm 1983; Franklin 1985; Miller 1985; Howard 1986; The Wildlife Society 1990b).

Wildlife sometimes causes significant damage to private and public property; other wildlife and their habitats; agricultural crops and livestock, forests, and pastures; and urban and rural structures. Wildlife also may threaten human health and safety or be a nuisance. Prevention or control of wildlife damage, which often includes removal of the animals responsible for the damage, is an essential and responsible part of wildlife management. Before wildlife damage control programs are undertaken, careful assessments should be made of the problem, with assurance that the techniques to be used will be effective and biologically appropriate (The Wildlife Society 1990b).

1 Purpose and Need

Natural resources, including soils, water, flora, and fauna, are sometimes adversely impacted by various wildlife species. The presence of some wildlife populations or individuals may cause degradation of water quality or soil erosion. Unacceptable habitat deterioration may also result from overconsumption of some plant species. Interspecific competition with threatened or endangered species sometimes results in unacceptable impacts on these species of special concern.

Economic losses often result from the presence of wildlife. These include damages to agricultural resources through depredations of livestock, crop, or forest resources and to buildings and other structures and properties by nesting, burrowing, feeding, or other activities. Damages may be relatively minor, or may be of such severity as to significantly affect profit margins and, consequently, livelihoods of producers or property owners.

The importance of wildlife management in protecting human health and safety is often unrecognized. Many bird and mammal species function as vectors or enhance the spread of disease to humans. Aircraft collisions with wildlife, primarily birds, pose a serious threat to public safety (Blokpoel 1976; Dolbeer 1991). Additionally, habituation of wildlife to humans in increasingly urbanized areas often results in wildlife with little or no fear of humans. Under these circumstances, human-wildlife interactions may lead to general nuisances, human illness or injury, or loss of life (Beier 1991).

Ignorance of laws and regulations protecting wildlife and governing use of control methods may result in affected individuals using methods that are illegal or environmentally harmful. Professional assistance is sought and demanded by the public. Responsible wildlife management provides a balance between human and wildlife needs and serves to reduce the frustration of individuals adversely affected by wildlife. It promotes tolerance toward wildlife in general and reduces the potential for environmentally unacceptable control actions.

As human populations expand, there are accompanying wildlife habitat modifications and loss of habitat for many species. The resulting competition for habitat and escalating negative human-wildlife interactions has created new challenges for society and wildlife managers. Additionally, increasing environmental awareness frequently results in the paradox of greater protection of wildlife with little or no consideration for responsible management of human-wildlife conflicts. Damage resolution is exacerbated by this increased protection. Therefore, wildlife damage management decisionmaking is becoming increasingly complex.

Conflicts between wildlife and human interests and resultant wildlife damage management needs are highly variable due to an almost infinite array of factors such as the wildlife species involved, their dynamics, and behavior. Likewise, there is a high variability among human populations, our cultures, and our behavior. The human-wildlife interface continues to grow and is dynamic. The resulting conflicts are dynamic as well.

Wildlife damage management is often misunderstood. Many individuals consider management options to consist largely of lethal control. However, lethal control is only one of many methods considered in development of management strategies. The alleviation of wildlife damage, whether addressed by professional managers or other individuals, consists of one or a combination of three basic actions: (1) management of the resource being negatively affected, (2) management of the wildlife responsible for, or associated with, damage, or (3) physical separation of the two. Resource management includes alteration of cultural practices such as animal husbandry or crop selection, other habitat modification, and alteration of human behavior. Management of the wildlife includes behavior alteration through harassment or scaring and population manipulation through translocation or lethal removal. Physical separation may consist of fencing, netting, or other barriers.

Actions are not based solely on economics. Rather, other environmental considerations of wildlife damage management actions, to include biological, physical, social, and legal factors, are weighed along with economic considerations to identify practical approaches to

each particular problem (Owens and Slate 1991). Because each damage situation is unique, standardization of control strategies is inappropriate. Individual assessments are necessary to determine specific solutions for each situation. This results in management approaches that are the most environmentally cost-effective.

All professions, including wildlife damage management, have a relatively similar approach to decisionmaking. To responsibly address a problem, professionals go through logical decisionmaking steps as illustrated in Figure 1-1. The problem is first identified, then a determination is made if the assistance requested is within existing authorities and abilities. Impacts of the problem are considered, and an assessment is made of the actions potentially applicable to the particular situation. This is followed by selection and implementation of those methods or approaches most appropriate. This process concludes with an assessment of the effectiveness of the actions to determine if additional treatment is required.

Wildlife damage management decisionmaking consists of concurrent, multi-stage considerations to determine impacts to, or caused by, the biological, economic, physical, or social environments, and legal duties and rights. Both immediate and long-term impacts of the damage or problem must be evaluated. Comparisons must be made among available methods to weigh the relative impacts of implementation of these methods to that of no action. Attention must also be given to environmental influences on the effectiveness and practicality of the various methods.

Initially, an assessment of the damage or conflict must be made to determine the species involved and extent of damage, including impacts on various environmental components. Consideration must also be given to future environmental impacts that may result in the absence of control actions and to legal implications to the property owner or manager, or possibly to the wildlife manager if no attempt is made to resolve the problem. The seriousness of the problem must be determined so relative comparisons can be made of management options potentially applicable to the particular situation.

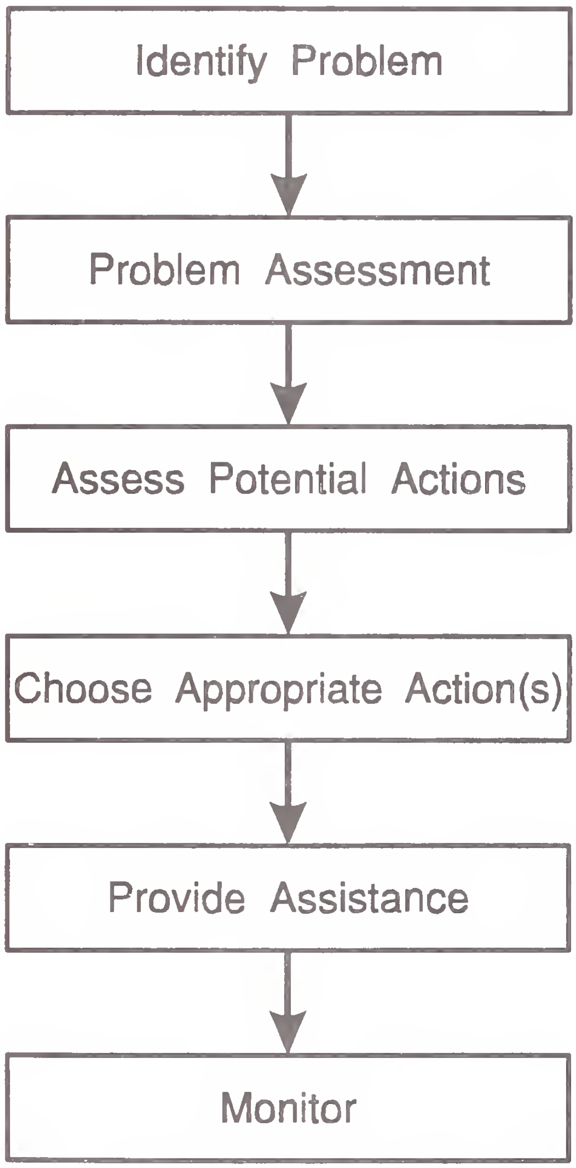
The most commonly recognized aspect of the decision process is that of evaluating methodologies, or action approaches. As with damage assessment, consideration must be given to the impacts of management actions on the various environments. Conversely, attention must be given to environmental impacts upon management actions. These include both positive and negative impacts. Of the array of methods potentially applicable to a particular situation, assessments must be made of the relative impacts on the various environmental components.

This assessment should identify appropriate methods that may be practical for each particular situation. The determination of which reasonable methods are to be initially implemented is dependent upon relative effectiveness and available expertise. Effective damage resolution is often best attained through the integration of several methods (i.e., integrated pest management or IPM), either simultaneously or sequentially.

Professional assistance may be provided via technical assistance, direct control, or a combination. Exclusionary methods and methods directed at managing the affected resource are usually implemented by the resource owner or manager. These include such actions as animal husbandry, crop management, fencing, structural improvement, and modifications of human behavior. Direct, hands-on management of wildlife may be implemented by the professional wildlife specialist or resource owner depending on legal constraints, expertise, or other factors. These actions are directed at moving or removing wildlife and include harassment, translocation, and lethal control efforts.

Wildlife damage control responsibilities and authorities are shared by various governmental agencies and are highly variable depending on species, type of problem, and location. The Federal government is primarily responsible for migratory birds and federally listed threatened and endangered species, whereas State agencies are primarily responsible for the management of most other species. Wildlife management agencies often share

Figure 1-1 **General Professional Action Model**



damage management responsibilities with other State and Federal agriculture, land management, and health agencies. Private wildlife damage control businesses, which are increasing in number, may receive specific authorities from various regulatory agencies to directly manage problem wildlife.

Varying responsibilities and expertise necessitate coordination among agencies to ensure optimum management of wildlife as well as other resources. Interagency liaison and coordination recognizes respective management authorities and responsibilities and is critical in identifying management needs. It promotes development of methodologies and strategies and sharing of expertise and technology, improves professional relationships, and assists in the proper management of wildlife populations and other natural resources across geopolitical boundaries. Agreements among State and Federal agencies provide for the cooperative management of various species, including management for the purpose of wildlife damage control.

D. USDA APHIS Animal Damage Control Program

Expanding human populations and the resultant competition with wildlife for limited habitat results in human-wildlife conflicts which are national in scope and, directly or indirectly, affect most components of our society. The ability of various governments and the general public to address such problems is complicated by numerous Federal, State, and local laws regulating the management of wildlife as well as the implementation of wildlife damage management methods. Wildlife damage management is becoming increasingly complex. Society expects government to provide leadership in wildlife damage management to ensure the maintenance of environmental quality while providing acceptable balances between human interests and wildlife needs. The United States Department of Agriculture, through the APHIS ADC program, is authorized and directed by Congress to develop the best methods and conduct activities to control damage caused by wildlife.

The mission of the APHIS ADC program is "to provide leadership in wildlife damage control to protect America's agricultural, industrial, and natural resources and to safeguard public health and safety."

This mission is accomplished through cooperative wildlife damage management programs; collection, evaluation, and dissemination of information; training of wildlife management personnel; and the provision of data and sources for limited-use pesticides. The APHIS ADC program is committed to environmental sensitivity; cooperator participation; employee growth and development; equal opportunity in employment and service delivery; scientific, technical, and managerial excellence; and professionalism in the practice of wildlife management.

The APHIS ADC program focuses on the protection of agriculture, including livestock, crops, aquaculture and mariculture, forests, and rangelands. Additionally, it provides wildlife damage protection for property and public health and safety through the control of wildlife-borne diseases and wildlife hazards to aircraft. The APHIS ADC program assists other Federal and State agencies in natural resources protection to include wildlife species of special concern such as threatened and endangered species.

The APHIS ADC program addresses both prevention and correction of wildlife damage problems in seeking acceptable balances between human interests and wildlife needs. Effective approaches to resolving wildlife damage problems are developed by integrating the use of several methods, either simultaneously or sequentially. Professional approaches and environmental considerations are incorporated in resolving damage problems. The variability among damage problems requires that each situation be independently assessed. Methods or management strategies are evaluated considering maximum damage resolution with minimal negative environmental impacts.

Research is conducted to improve existing technology as well as develop new management approaches. Such activities are appropriately coordinated with field personnel, universities and other academic institutions, other agencies, and private industry. Information developed through program activities is communicated through various information transfer mechanisms to include onsite assistance, workshops, seminars, classroom teaching, and publications.

APHIS ADC program services are provided after specific requests, and are delivered through a collection of cooperative programs with other Federal, State, and local agencies and private entities. All activities are based on relationships that require close cooperation and coordination. The type and extent of program services provided are highly variable among States, depending on laws and regulations, species involved, need, and available financial resources.

Interagency liaison and coordination are established and conducted through numerous Memoranda of Understanding (MOUs). These MOUs are formal, nonfunding agreements that establish the framework governing APHIS ADC activities by defining program responsibilities and establishing procedures for cooperation in areas of mutual interest. APHIS ADC operates under MOUs with the USDA Forest Service (FS) and Extension Service; the U.S. Department of Defense (DOD); the U.S. Department of the Interior (USDI) Fish and Wildlife Service (USFWS) and Bureau of Land Management (BLM); the U.S. Department of Transportation (USDOT) Federal Aviation Administration (FAA); State wildlife management, agriculture, and health agencies; and universities. To enhance interagency coordination, APHIS ADC personnel are strongly encouraged to actively participate in professional organizations and activities at local, State, and national levels.

APHIS ADC program services are available upon request to all U.S. citizens and institutions. However, APHIS ADC efforts are largely directed toward cooperative, cost-shared activities. Also, congressional appropriation bills frequently direct APHIS to perform specific damage control activities or to devote financial resources to specific damage problems or research tasks (e.g., blackbird depredation in North Dakota).

Cooperative funding is a critical component impacting program availability and delivery and is a key factor determining variability among APHIS ADC State programs. Supervised and primarily funded by APHIS, most of the field activities are funded in part by other Federal, State, or local agencies; industry groups; or individuals requiring wildlife damage control assistance. Annual work plans are developed that describe how the work will comply with applicable laws, regulations, and policies, and enhance, complement, or supplement related activities of other agencies or individuals. Work plans identify specific goals based on management objectives and policies of APHIS and cooperating agencies.

The APHIS ADC program is continually evolving in response to changing needs, information, and technology.

1. History of Federal Wildlife Damage Control

The first Federal Government involvement in wildlife damage control efforts occurred in 1885 when the USDA's Branch of Economic Ornithology sent questionnaires to farmers about damage caused by birds (Di Silvestro 1985). The following year the Branch of Economic Ornithology was elevated to Division status and renamed the Division of Economic Ornithology and Mammalogy. The Commissioner of Agriculture stated that the new Division's responsibility would be to educate farmers about birds and mammals affecting their interests so that the destruction of useful species might be prevented (Hawthorne 1987). Efforts to educate farmers included conducting studies and demonstrations of wildlife damage control techniques in the Western United States and testing

poisons for control of the house sparrow. The Division's name was changed in 1890 to the Division of Ornithology and Mammalogy and in 1896 to the Division of Biological Survey.

In 1905, the Division's name was changed again, to the Bureau of Biological Survey. Between 1905 and 1907 the Bureau investigated and published methods for coyote and wolf control in conjunction with the FS. At the same time, western livestock interests began voicing opposition to fees levied by the Federal Government for livestock grazing on Federal lands in areas with high populations of coyotes and wolves.

As agricultural interests began to speak out, more attention was focused on problems with wildlife. In 1913 direct control work began under a small administrative allotment of funds to control plague-bearing rodents in California National Forests. During the following year the first cooperative agreement was signed by the president of the New Mexico College of Agriculture and Mechanical Arts and the Secretary of Agriculture. In 1914 Congress responded to the concerns of farmers and ranchers by appropriating funds for experiments and demonstrations on predator control. The first congressional appropriation for Federal predator control operations came in 1915 when Congress appropriated $125,000 to the Bureau of Biological Survey to control wolves and coyotes. In response to the need for meat during World War I, congressional appropriations for wildlife damage control increased (Cain et al. 1972).

The 1916 Convention with Great Britain for the Protection of Migratory Birds and the 1918 Migratory Bird Treaty Act authorized the issuance of permits for the taking of migratory birds that were injurious to agriculture and other interests (Di Silvestro 1985). The need for improved methods and techniques for the control of predators and rodents led to the establishment of a laboratory in Albuquerque, NM, for experimentation with poisons. In 1921 this laboratory, called the Eradication Methods Laboratory, was moved to Denver, CO. In 1923 the laboratory was renamed the Control Methods Laboratory. Years later, this facility would become known as the Denver Wildlife Research Center (DWRC). In 1928 the Office of Ornithology and Mammalogy within the Bureau of Biological Survey was upgraded to a Division, and the name was changed to the Division of Economic Investigations. The following year the name was changed to the Division of Predatory Animal and Rodent Control (Hawthorne 1987).

Although the need for wildlife damage control efforts was acknowledged by Congress, some felt the Federal program was unnecessary. In 1930 the American Society of Mammalogists issued a strong statement of opposition to the Federal predator control program. This nearly caused the cancellation of the $1 million congressional appropriation for predator and rodent control (Wagner 1988). In 1931, after full congressional hearings, a bill was passed by Congress and signed by President Hoover that gave the Federal Government authority to conduct wildlife damage control activities and to enter into cooperative agreements with States, individuals, and public and private agencies, organizations, and institutions. This bill became the Animal Damage Control Act of March 2, 1931, and remains the primary statutory authority under which the current APHIS ADC program operates.

In 1934, under the Fish and Wildlife Coordination Act, a law enforcement function was added to the Division of Predatory Animal and Rodent Control. The name was changed to the Division of Game Management, which included the Section of Predator and Rodent Control. That same year Congress appropriated funds to buy property in Pocatello, ID, for a facility to produce baits for the predator and rodent control programs. The facility was opened in 1936 as the Pocatello Supply Depot (PSD), which remains an integral part of the current APHIS ADC program.

The Section of Predator and Rodent Control was separated from the Division of Game Management in 1938 and was named the Division of Predator and Rodent Control. The following year, under President Franklin Roosevelt's government reorganization plan, the

Bureau of Biological Survey of the USDA and the Bureau of Fisheries of the Department of Commerce were transferred to the USDI, forming the USFWS. The Reorganization Plan Number II.4(f), Title 5, Section 133t transferred wildlife damage control functions to USDI's new Branch of Predator and Rodent Control. The reorganization was part of President Roosevelt's attempt to consolidate within USDI all Federal activities dealing primarily with wildlife (Di Silvestro 1985). Theoretically, this presented the USFWS with a dual mandate of both controlling and enhancing certain wildlife species depending on the circumstances.

The Fish and Wildlife Coordination Act of 1934 was amended in 1946 to authorize the Secretary of the Interior to cooperate with other Federal, State, and private agencies in minimizing damage caused by "overabundant" species. Two years later the Lea Act was passed, which authorized the rental or purchase of up to 20,000 acres in California as a feeding site for ducks and geese to decoy them from unharvested crop lands. That same year, because of a worldwide shortage of cereal foods, Congress appropriated funds for USDA and USDI to become involved with rat control. The Division of Predator and Rodent Control conducted extensive commensal rodent control programs that further established wildlife damage control efforts in the Eastern United States (Hawthorne 1987). Also in 1948 the Division was renamed the Branch of Predator and Rodent Control.

The Federal ADC program operated during the 1940's and 1950's in relative obscurity with little public opposition. During this time the program comprised several components, including research, technical assistance, and both lethal and nonlethal direct control activities. The type of Federal assistance provided depended on the location, the local institutions, and the resource being protected. However, a trend in environmental awareness surfaced in the 1960s that brought the ADC program under closer scrutiny. The use of poisons to kill predators increasingly came under criticism, even from traditionally conservative interests such as editors of national hunting and fishing magazines (Di Silvestro 1985).

In 1963, Secretary of the Interior Stewart Udall appointed a group called the Advisory Board on Wildlife Management to investigate Federal wildlife damage control efforts. The Board published a report in 1964 officially entitled Predator and Rodent Control in the United States (Leopold et al. 1964), but the report is more commonly referred to as the Leopold report, named after Chairman of the Advisory Board A. Starker Leopold. The report was critical in many ways of the Federal ADC program and charged it with indiscriminate, nonselective, and excessive predator control. The report stated that the leghold trap was nonselective and was the cause of unnecessary loss of wildlife. In response to recommendations made in the Leopold report, the Branch of Predator and Rodent Control was renamed the Division of Wildlife Services and was given responsibility for wildlife control and management (Branch of Wildlife Enhancement) and for monitoring pesticide use (Branch of Pesticide Monitoring and Surveillance). The 1969 Animal Damage Control Policy Manual, developed by the Division of Wildlife Services, incorporated recommendations made in the Leopold report: Professionally trained personnel were added to the Division; in-service training for long-time employees was instituted; nearly all predator control practices were reduced; and regulation and supervision of toxicant use were tightened (Wagner 1988).

Predator control continued to be the focus of public attention. In 1971, spurred by lawsuits from animal welfare groups over program use of toxicants, the Secretary of Interior and the President's Council on Environmental Quality (CEQ) appointed a seven-person Advisory Committee on Predator Control. The chairman of the committee was a member of the previous Advisory Board on Wildlife Management, Stanley Cain. The Advisory Committee's report (published in 1972), like the Leopold report, took on the name of the committee's chairman; it is commonly known as the Cain report.

Whereas the Leopold report acknowledged the use of toxicants as an appropriate control tool given tighter legal controls, the Cain report stated that the use of chemicals is likely to be inhumane and nonselective, and it recommended that landowners be trained in the use of leghold traps as a major method of predator damage control. The Cain report was generally critical of Federal predator control efforts, stating that the claimed ecological benefits of predator control were exaggerated. The report outlined 15 recommendations for changes in the Federal predator control program. The recommendation that immediate Congressional action be sought to remove all toxic chemicals from registration and use for direct predator control had the most direct impact on Federal program operations. The report further recommended that restrictions be extended to those toxicants used in field rodent control that may cause secondary poisoning of scavengers (Cain et al. 1972).

As a result of the recommendations in the Cain report, President Richard Nixon signed Executive Order 11643 on February 8, 1972, banning the use of toxicants for predator control by Federal agencies or for use on Federal lands. The U.S. Environmental Protection Agency (EPA) followed President Nixon's order by canceling the registrations of the chemicals: Compound 1080, strychnine, sodium cyanide, and thallium sulfate.

In 1974, the Division of Wildlife Services was replaced by the Office of Animal Damage Control. The Branch of Wildlife Enhancement and the Branch of Pesticide Monitoring and Surveillance were moved to another USFWS division.

President Nixon's Executive Order 11643, banning the use of toxicants for predator control, was amended in 1975 by President Gerald Ford (Executive Order 11870) to allow the experimental use of sodium cyanide in a control device called an M-44. This device releases sodium cyanide into the mouth of an animal when triggered. Executive Order 11643 was amended again in 1976 (Executive Order 11917) to allow the reregistration of sodium cyanide for predator control.

In 1978, the Secretary of the Interior appointed an Animal Damage Control Policy Study Committee to review the Federal ADC program. The Committee's report to the Assistant Secretary for Fish, Wildlife, and Parks was very critical of the ADC program. The committee found insufficient documentation to justify the program's existence. As a result of this report and related public hearings, the USDI prepared the December 1978 report, *Predator Damage in the West: A Study of Coyote Management Alternatives* (USDI 1978). This summarized all pertinent information and was developed to serve as a source document for consideration by the Secretary in making decisions about the ADC program. The Animal Damage Control Environmental Impact Statement was subsequently issued in 1979 by the USFWS.

The Animal Damage Control Policy Study Committee's report led to a policy statement issued by Secretary of the Interior Cecil Andrus on November 8, 1979, which stopped denning (i.e., finding and killing coyote pups at their den) and research on the use of the chemical Compound 1080. The policy was an attempt to emphasize the use of nonlethal control methods.

In a memorandum dated January 25, 1980, the Western Regional Coordinating Committee, composed of 28 university research and extension personnel and various Federal employees of USDA and USDI, reacted adversely to Secretary Andrus' policy. They were concerned that the policy showed minimal understanding of livestock industry problems and minimal knowledge of the realities of predator losses and control. The Committee's concerns reflected a growing opinion that the ADC function would be better served if it were administered by the USDA. In 1980, Congress passed Public Law 96-528, which directed the Secretaries of Agriculture and Interior to assess the pros and cons of transferring some or all of ADC's functions from USDI to USDA (Wagner 1988).

In 1981, the U.S. Environmental Protection Agency (USEPA) held hearings on the predator control issue. At the same time Secretary of Interior James Watt rescinded former Secretary Andrus' policy statement that banned denning. Shortly thereafter President Reagan

signed Executive Order 12342, which revoked President Nixon's Executive Order 11643 banning the use of toxicants and President Ford's amendments to that Order. In 1984 the Office of Management and Budget (OMB) directed the USFWS to evaluate the possibility of transferring the ADC program's function to private business as part of the privatization initiative contained in OMB Circular A-76. After thorough screening, insufficient non-government functions were identified to warrant further consideration.

In 1985, 20 U.S. Senators wrote President Reagan to request that he place the ADC program back under the USDA, from which it was removed in 1939. However, the U.S. Justice Department issued an opinion, following referral of the question from Interior Secretary Hodel and Agriculture Secretary Block, that to return the ADC program to USDA would require legislation.

Congress responded to the U.S. Justice Department's opinion by passing an amendment to the 1986 continuing Federal budget resolution, which transferred all ADC program personnel, equipment, and funding from the USFWS to USDA. By April 1986, transfer of all personnel and resources had been completed.

In 1986, the National Animal Damage Control Advisory Committee, comprised of agricultural producers, environmental and animal welfare organizations, and academic institutions, was appointed by the Secretary of Agriculture to provide advice on policies and issues of concern to the APHIS ADC program.

In November 1987, APHIS began an internal review of its structure and functions. On the basis of review recommendations, the agency was restructured. The most significant change in the APHIS ADC program resulting from the reorganization of APHIS was the shift of the research component (DWRC) from ADC to APHIS Science and Technology. In early 1992, DWRC was transferred back to ADC.

At the end of 1987, Congress authorized APHIS ADC to conduct control activities of nuisance mammals and birds (except for urban rodent control) that are reservoirs for zoonotic diseases.

Internal reviews and strategic planning conducted by the APHIS ADC program subsequent to the 1986 transfer resulted in greatly expanded efforts directed at increased professionalism and training, improved relationships with other wildlife management agencies, improved data collection systems, and development of new control methods technology. This recognizes continually changing needs of both the public and wildlife and the corresponding responsibilities of APHIS ADC in addressing these needs.

Since its formation, the ADC program has continually evolved. Increasing emphasis has been placed on the development and implementation of integrated management approaches including multiple forms of technical assistance and direct control services. IPM, a long-time component of program activities, was formally recognized as standard operating procedure in 1989.

In June 1990, the Draft Environmental Impact Statement for the APHIS ADC program was released for public comment. The Supplement to the Draft Environmental Impact Statement was released for public comment in January 1993 which included revisions, additional information, and analyses, developed in response to comments. This final EIS includes analyses of two additional alternatives not separately evaluated in the Draft or Supplement EISs, and more information developed in response to comments. This final EIS provides the basis for future direction of the APHIS ADC program.

E. Authorities

The APHIS ADC program is authorized by Congress to conduct activities relating to most wildlife damage situations. Additionally, APHIS ADC field activities are conducted within authorizations received from cooperating Federal and State regulatory agencies. The primary statutory authority for the APHIS ADC program is the Animal Damage Control Act of March 2, 1931, as amended (7 U.S.C. 426-426c; 46 Stat. 1468):

> The Secretary of Agriculture is authorized and directed to conduct such investigations, experiments, and tests as he may deem necessary in order to determine, demonstrate, and promulgate the best methods of eradication, suppression, or bringing under control on national forests and other areas of the public domain as well as on State, Territory or privately owned lands of mountain lions, wolves, coyotes, bobcats, prairie dogs, gophers, ground squirrels, jack rabbits, brown tree snakes, and other animals injurious to agriculture, horticulture, forestry, animal husbandry, wild game animals, fur-bearing animals, and birds, and for the protection of stock and other domestic animals through the suppression of rabies and tularemia in predatory or other wild animals; and to conduct campaigns for the destruction or control of such animals: *Provided,* That in carrying out the provisions of this section the Secretary of Agriculture may cooperate with States, individuals, and public and private agencies, organizations, and institutions.

7 U.S.C. 426.

The language of the ADC Act was appropriate for attitudes at that time, i.e. "...eradication, suppression..." and "...conduct campaigns for the destruction...." However, since 1931 human-wildlife relationships have changed. Societal values have changed as well. Therefore, greater emphasis is placed on that part of the Act that speaks to "...bringing under control...." The APHIS ADC program addresses both prevention and correction of wildlife damage problems and, in consideration of contemporary values, seeks acceptable balances between human interests and wildlife needs.

Additional statutory authority is provided by the Rural Development, Agriculture, and Related Agencies Appropriations Act of 1988 (Public Law 100-202, Dec. 22, 1987, Stat. 1329-1331 (7 U.S.C. 426c)):

> That hereafter, the Secretary of Agriculture is authorized, except for urban rodent control, to conduct activities and to enter into agreements with States, local jurisdictions, individuals, and public and private agencies, organizations, and institutions in the control of nuisance mammals and birds and those mammal and bird species that are reservoirs for zoonotic diseases, and to deposit any money collected under any such agreement into the appropriation accounts that incur the costs to be available immediately and to remain available until expended for Animal Damage Control activities.

Other legal directives guiding the APHIS ADC program include the National Environmental Policy Act (Public Law 91-190, 42 U.S.C. 4321 et seq.; 83 Stat. 852), as amended; the Federal Insecticide, Fungicide, and Rodenticide Act (7 U.S.C. 136 et seq.; 86 Stat. 975), as amended; the Fish and Wildlife Coordination Act (16 U.S.C. 661-666c; 48 Stat. 401), as amended; the Fish and Wildlife Act of 1956 (16 U.S.C. 742j-1; 70 Stat. 1119; (Airborne Hunting)), as amended; the Endangered Species Act of 1973 (16 U.S.C. 1531, 1543; 87 Stat. 884), as amended; the Migratory Bird Treaty Act (16 U.S.C. 703-711; 40 Stat. 755), as amended; the Animal Welfare Act (7 U.S.C. 2131-2156; 80 Stat. 350); the Bald Eagle Protection Act (16 U.S.C. 668-668d; 454 Stat. 250), as amended; the McNary-Sweeney Reforestation Act (16 U.S.C. 581-581i; 45 Stat. 699), as amended; the Game Management Supply Depots Act of June 24, 1936 (16 U.S.C. 667; 49 Stat. 1913); the Toxic Substance Control Act (15 U.S.C. 2601-2629; 90 Stat. 2003); the Foreign Assistance Act of 1961 (22 U.S.C. 276 et seq.; 75 Stat. 424), as amended; and the Federal Aviation Administration, Federal Aviation Regulation (14 CFR Part 139).

APHIS ADC activities involving federally protected wildlife species are regulated by the USFWS. The taking of these species by APHIS ADC requires specific authorization from the USFWS as mandated by Title 50, Code of Federal Regulations (50 CFR 13, 17, and 21). Activities involving resident wildlife (i.e., those protected by State laws) are regulated by the respective State agencies and similarly require appropriate authorizations. Additionally, other local laws and regulations often place further restrictions on APHIS ADC activities.

F. The NEPA Process

NEPA sets forth the requirement that all major Federal actions be evaluated in terms of their potential significant impacts on humans and the natural environment for the purpose of avoiding or, where possible, minimizing significant adverse impacts. NEPA established the President's Council on Environmental Quality (CEQ) to oversee the Federal Government's responsibilities. Federal activities affecting the physical and biological environment are regulated in part by CEQ through regulations in Title 40, Code of Federal Regulations, Parts 1500-1508. In accordance with CEQ and USDA regulations, APHIS Guidelines Concerning Implementation of NEPA Procedures, as published in the Federal Register (44 FR 50381-50384, August 28, 1979), provide guidance to APHIS regarding the NEPA process and EIS preparation.

Pursuant to NEPA and CEQ regulations, an EIS documents the analysis of a proposed Federal action's impacts, informs decisionmakers and the public of reasonable alternatives capable of avoiding or minimizing adverse impacts, and serves as a decision-aiding mechanism to ensure that the policies and goals of NEPA are infused into Federal agency actions. An EIS is prepared by integrating as many of the natural and social sciences as may be warranted based on the potential effects of the proposed action. The direct, indirect, and cumulative impacts of the proposed action are analyzed.

1. Scoping

To comply with NEPA requirements, an EIS was prepared for the ADC program in 1979 by the USFWS (USDI 1979) that analyzed the 1977 mammalian predator damage control activities in 16 western States. In 1986 the ADC program was transferred from USFWS to USDA. Because of this transfer, as well as the lack of programmatic analysis in the 1979 EIS and the age of the document, a decision was made to prepare an updated programmatic EIS for the APHIS ADC program.

The analysis of the current APHIS ADC program and proposed alternatives is based on the many issues affecting the current program. Such issues were identified by scoping, during which interested government agencies and the public raised concerns that should be addressed in the preparation of the final EIS. Public scoping is required under the CEQ NEPA regulations. Scoping for this EIS began on November 16, 1987, when APHIS gave notice in the Federal Register (52 FR 43778) of its intent to prepare a new EIS for the APHIS ADC program.

The notice stated that the following issues would be discussed in the EIS:

- Impacts of the different alternatives on the biological environment, including target and nontarget species.
- Impacts of the alternatives on the physical environment, including soil, water quality, and air quality.
- Impacts of the alternatives on other aspects of the human environment, including the cultural environment, domestic animals, economy, energy, public attitudes, public health, recreation, safety, and wilderness areas.

The notice solicited public involvement in the form of either oral or written comments on the different alternatives and issues. Three public meetings were held to receive oral comments: December 15, 1987, in Sacramento, CA; December 17, 1987, in Kansas City, MO; and December 21, 1987, in Washington, DC. Written comments were accepted by APHIS until January 20, 1988.

Oral comments were received from 17 speakers at the public scoping meetings, and written comments were received from 251 persons or organizations, concerning the current APHIS ADC program and proposed EIS. All written statements and the verbatim transcripts of oral statements were reviewed by APHIS ADC personnel. Public comments were categorized as reaction to the four EIS alternatives listed in APHIS's November 16, 1987, Federal Register Notice; other statements that writers or speakers clearly intended for consideration as EIS alternatives; issues and concerns that respondents specifically requested to have addressed in the EIS; and other statements. A summary of the public comments is presented in Appendix G.

2. Analysis

Public comments and proposed alternatives were evaluated on the basis of practicality and reasonableness of implementation. Originally, three alternatives representative of those suggested by the public and consistent with the issues identified in the scoping process, were developed and analyzed in detail. Later, as a result of public comments, two additional alternatives were analyzed and considered in detail in this final EIS. The reasonable, effective alternatives were then analyzed to assess the comparative environmental (biological, economic, sociocultural, and physical) effects of each. The results of the analyses of the five alternatives evaluated in detail are reported in Chapter 4 and Appendix N.

3. Documentation

A Draft EIS was published in July 1990. Comments were accepted from the public and from various governmental agencies. As a result of these comments, this document has been revised using one of three approaches to respond to each comment: (1) minor changes in text; (2) explanation but no change in text; and (3) further analysis or extensive changes in text. A Supplement to the Draft EIS was published in January 1993. The same approach was used to address comments as on the Draft. After public and agency comments were considered, this document has been revised in response to these comments and is being issued as a final EIS. A Record of Decision will be produced following the publication of this final EIS. As needed, further analyses will be conducted on site-specific situations that are not covered by this document.

4. Implementation

The program will be carried out in agreement with APHIS ADC's standard operating procedures and mitigation necessary to protect against adverse environmental impacts (Chapter 5).

5. Monitoring

Monitoring will be used to assure that decisions are implemented and effective, to determine effects of the actions, and to validate procedures and rationale.

G. Key Laws and Regulations

In addition to the Animal Damage Control Act and NEPA, there are several Federal laws which significantly impact APHIS ADC activities. APHIS ADC complies with each of the following laws and consults with each agency as appropriate.

1. The Fish and Wildlife Act

Section 742j-1 of this Act permits airborne hunting for the protection of wildlife and agriculture under specific conditions.

2. Endangered Species Act

Section 7 of the Endangered Species Act (ESA)requires Federal agencies to consult with the Secretary of the Interior to ensure that any action that they authorize, fund, or carry out is not likely to jeopardize the continued survival of any endangered or threatened species or result in the adverse modification or destruction of such species' critical habitat (16 U.S.C. 1536 (a)(2)). In addition, the act requires that if species proposed for listing are likely to be jeopardized, a conference must be held with the USFWS. This consultation may result in modification or abandonment of an action. (See Appendix F.)

3. Migratory Bird Treaty Act

The Migratory Bird Treaty Act provides the USFWS regulatory authority to manage migratory birds. USFWS permits are required for some activities affecting migratory birds.

4. Fish and Wildlife Conservation Act

The Fish and Wildlife Conservation Act encourages Federal agencies to conserve and promote conservation of nongame fish and wildlife and their habitats to the maximum extent possible within each agency's statutory responsibilities.

5. Animal Welfare Act

The Animal Welfare Act authorizes the Secretary of Agriculture to regulate the transport, sale, and handling of dogs, cats, nonhuman primates, guinea pigs, hamsters, and rabbits intended to be used in research or "for other purposes."

6. Federal Insecticide, Fungicide, and Rodenticide Act

The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), as amended (7 U.S.C. 136 et seq.) provides for the registration, classification, and regulation of all pesticides. USEPA is responsible for implementing FIFRA; primary enforcement responsibilities for use-related violations are assigned to States with approved programs.

All pesticides used in the United States must be registered by the USEPA which assesses the nontarget and other environmental risks associated with the chemicals. USEPA's determinations are based on stringent research data supplied by registration applicants.

States may further restrict pesticide use. The USEPA registration process is discussed in Appendix P, Risk Assessment for APHIS ADC Chemical Methods, Introduction and Overview.

7. Clean Air Act

The Clean Air Act, as amended (42 U.S.C. 1857 et seq.), sets national primary and secondary ambient air quality standards, requires that specific emission increases be evaluated to prevent a significant deterioration in air quality, and provides USEPA with authority to set national standards for performance of new stationary sources of air pollutants and standards for emissions of hazardous air pollutants.

8. Clean Water Act

The Clean Water Act requires all branches of the Federal Government involved in an activity that may result in a point source discharge or runoff of pollutants to water to comply with applicable Federal, State, interstate, and local requirements concerning the control and abatement of water pollution.

9. Safe Drinking Water Act

The Safe Drinking Water Act (42 U.S.C. 300(f) et seq.) allows USEPA to designate any aquifer that serves as the principal source of drinking water for an area as a "sole source" aquifer. Federal agencies are prevented from granting assistance to any project that may contaminate such an aquifer and thus create a significant health hazard.

H. Interrelationships

The APHIS ADC program is cooperative in nature and activities often overlap ownership and management boundaries. Coordination is required in planning and implementing wildlife damage management activities.

1. Federal Agencies

a. FS and BLM

The USDA FS, USDI BLM, State, and private lands often share common boundaries. In order to prevent or reduce duplication, both FS and BLM have requested and been granted cooperating agency status on this final EIS. This will ensure a closely coordinated program and that methodology, mitigation, and monitoring meets the standards described herein. Specific project and program coordination will take place as needed between all management levels of each agency.

b. FAA

The Federal Aviation Administration requires by Federal Aviation Regulation 14 CFR Part 139 to insure that certified airports provide measures to alleviate or eliminate wildlife hazards to air carrier operations.

c. Other Federal Agencies

APHIS coordinates specific projects and programs with agencies, such as DOD, USFWS, the National Park Service, Soil Conservation Service, and Cooperative Extension Service when proposed actions may affect resources managed by these agencies or other areas of mutual concern.

2. State Agencies

In many States the APHIS ADC program works extensively with, or receives substantial cooperative funds from, State wildlife or agricultural agencies. Though supervised by APHIS ADC, the program may be a budgeted State program that is accountable to State legislative and budgetary requirements.

3. Native Americans/Alaskan Natives

Cooperative programs developed between APHIS and tribal governments may be conducted on tribal and trust lands. In carrying out these programs, APHIS complies with the American Indian Religious Freedom Act (42 U.S.C. 1996) which provides for the protection and preservation of American Indian religious beliefs. The views of Native Americans relative to religious or cultural effects will be considered in project specific consultation documents and in State specific programmatic agreements.

4. Private Landowners

APHIS has, or could have, cooperative agreements and provide technical assistance or direct control assistance to private land owners in any State.

Private landowners are highly interested in APHIS operations on or near their land, and APHIS strives to keep these landowners informed about its wildlife management operations through coordination, cooperation, and consultation. Before preparing environmental documents, APHIS invites public participation.

I. Requirements for Further Environmental Analysis

This final EIS is a programmatic document that addresses environmental impacts at a general level because of the broad area over which these impacts might occur. Site-specific analyses and documentation (including application of categorical exclusions where appropriate) on proposed wildlife management plans or actions may be prepared on individual project levels. These will be tiered to this EIS and other applicable EIS's, including those for land management plans, timber management programs, and grazing management programs. These interdisciplinary analyses may be conducted by APHIS or the cooperating agencies with APHIS input. During site-specific analysis and documentation, public involvement will occur in accordance with the CEQ regulations for implementing NEPA.

Amendments to this final programmatic EIS may be necessary as new or improved methods are developed, changes occur in the program or its delivery, or coverage of the document is expanded. These amendments will keep this final EIS dynamic in nature.

Two classes of amendments will be produced:

- Insignificant Amendments: Amendments that cause no change in emphasis or classes of activities and do not have significant environmental impacts (40 CFR 1508.27).

- Significant Amendments: Amendments that are new types of activities, change program emphasis or that have potentially "significant" impacts to the environment (40 CFR 1508.27).

Insignificant amendments will be made by the APHIS Administrator or his delegated representative with appropriate public notification. Significant amendments will be subjected to NEPA analysis and put in force with a record of decision or "finding of no significant impact."

Chapter 2

Proposed Program Alternatives

Readers Guide

Chapter 2: Proposed Program Alternatives

Provides information pertaining to:

- Development of alternatives.
- Current APHIS ADC program.
- APHIS ADC Decision Model for Wildlife Damage Management Methods.
- Other alternatives.
- Comparison of alternatives.
- Preferred alternative.

Chapter 2

Proposed Program Alternatives

Table of Contents

A. Introduction

Chapter 2 describes the process by which the Environmental Impact Statement (EIS) alternatives were developed. Thirteen program alternatives were identified as a result of public scoping and comments. Many of them consist of different administrative approaches that would result in environmentally similar impacts. The 13 alternatives were evaluated on the basis of a set of program constraints. As a result of this evaluation, five alternatives are presented in detail in this EIS. Most of this chapter is devoted to detailed descriptions of these five alternatives: No Action Alternative, Current Program Alternative, Nonlethal Control Program Alternative, Nonlethal Before Lethal Control Program Alternative, and Damage Compensation Program Alternative.

Public and agency comments on the draft EIS requested that the relationship between proposed program alternatives analyzed in detail in this EIS and those not analyzed in detail be clarified, and that additional information be provided about Animal and Plant Health Inspection Service (APHIS) Animal Damage Control's (ADC) use of the Integrated Pest Management (IPM) approach. In response to these comments, this chapter includes Tables 2-2 and 2-5, intended to clarify the relationship between alternatives analyzed in detail and those not analyzed in detail. Additionally, the discussion of the "APHIS ADC Decision Model" has been developed to provide information about APHIS ADC's IPM approach and its relationship to the NEPA process.

B. Development of the Alternatives

APHIS gave notice in the *Federal Register* (52 FR 43778, November 16, 1987) of its intent to prepare a new EIS for the APHIS ADC program. Presented in the notice were four possible program alternatives for consideration in the EIS: (1) the Current Program Alternative; (2) No Action Alternative (i.e., no APHIS ADC program); (3) an Eradication Program Alternative (i.e., planned, total elimination of specific pest wildlife populations in designated areas); and (4) a Suppression Program Alternative (i.e., planned, long-term reduction of pest wildlife populations in designated areas).

Comments regarding the APHIS notice of intent to prepare an EIS were received from 17 speakers at the public scoping meetings. Written comments from approximately 251 persons or organizations concerning the present APHIS ADC program and proposed EIS were logged in at the APHIS Office of Regulatory Coordination. All written statements and the court recorder's transcripts of all oral statements were systematically searched by an EIS Scoping Work Group for the following information:

- Reactions to the four EIS alternatives listed in APHIS' November 16, 1987, *Federal Register* notice.
- Other statements that writers or speakers clearly intended for consideration as EIS alternatives.
- Issues and concerns that respondents asked to have addressed in the EIS.
- Other statements.

The scoping group summarized the public comments in these four categories.

Alternatives that were suggested during scoping, issues suggested during scoping, concerns requested to be addressed in the EIS, and other statements that were based on the scoping group's assessment of public comments are presented in Appendix G.

In developing the set of APHIS ADC program alternatives for analysis in the EIS, APHIS ADC program personnel considered the public scoping comments to determine whether the proposed alternatives constituted practicable and reasonable approaches. Other institutional and methodological options that were not distinct from the final set of alternatives were also considered.

2 Environmental Consequences

From September 1987 to January 1989, APHIS ADC program personnel formulated possible program alternatives to be addressed in the EIS. Additional alternatives were developed from May to September 1993 in response to public comments on the Supplement to the Draft Environmental Impact Statement. The following alternatives were selected as both representative of the alternatives suggested by the public during scoping and consistent with the issues identified during the scoping process:

- No Action Alternative (no ADC program activity under APHIS).
- Current Program Alternative.
- Nonlethal Control Program Alternative.
- Nonlethal Before Lethal Control Program Alternative.
- Damage Compensation Program Alternative.
- Direct Control Only, With Supporting Research Alternative.
- Technical Assistance Only, With Supporting Research Alternative.
- Conversion of Direct Control Programs to Educational and Technical Assistance, With Transfer of Funds and Responsibilities to the U.S. Department of Agriculture (USDA), Extension Service (ES) Alternative.
- Reduction of Federal Manpower and Transfer of Federal Control Operations to Private Contractors Alternative.
- Transfer of Current Program, Including Funds, to State Wildlife Management agencies Alternative.
- Continuation of Western Coyote Work at APHIS; Transfer of Eastern Bird Work to the Department of Interior, U.S. Fish and Wildlife Service (USFWS) Alternative.
- Eradication Alternative (all program efforts directed toward planned, total elimination of specific pest wildlife populations in designated areas).
- Suppression Alternative (all program efforts directed toward planned, long-term reduction of specific pest wildlife populations in designated areas).

The main features of these alternatives are compared in Table 2-1.

All of these alternatives were evaluated on the basis of the following constraints:

- The APHIS ADC program currently operates under a congressional mandate (Animal Damage Control Act of 1931), with yearly appropriations for general use and, in some instances, specific use. For example, in fiscal year (FY) 1988 Congress directed APHIS to spend $300,000 for grackle damage control in Texas, $200,000 for blackbird-resistant sunflower research in North Dakota, and $40,000 for protection of maple sap tubing from damage by small rodents in Vermont. The appropriation bill also contained several other specific directives. The FY 1988 appropriation for APHIS ADC was approximately $25 million. This is the baseline Federal budget against which all alternatives are compared.
- The APHIS ADC program alternatives must be programmatic. They must encompass the national needs for wildlife damage control. These needs differ among states, requiring the APHIS ADC program to be diverse and dynamic. The program under any alternative should be adaptable to the varying situations and needs encountered.
- The APHIS ADC program is service oriented; it does not promulgate regulations and is not a regulatory or enforcement agency. Any proposed alternative must retain the service orientation.
- The program alternatives must be legally, socially, environmentally, and politically acceptable, as well as economically feasible.

Table 2-1

Alternatives Based on Public Scoping and Assessment of Issues Affecting the Current APHIS ADC Program

Alternatives Considered	APHIS Actions Taken Under Alternative	Agencies/Individuals Responsible for Administration and Application	Funding Considerations	Other Aspects of This Alternative
No Action Alternative	No direct control. No technical assistance No supporting research.	APHIS would not be responsible for conducting a wildlife damage control program. Other Federal agencies might elect or be mandated to assume responsibility for present APHIS ADC program activities. State agencies and/or individuals might assume new or greater responsibility for wildlife damage control.	No APHIS ADC funds would be expended for wildlife damage control. Federally administered programs may be funded by direct appropriation for agencies conducting specific programs. State-administered programs could be funded through varying sources. Individuals might increase their own expenditures for wildlife damage control.	In the absence of the APHIS ADC program, existing national oversight and coordination of wildlife damage control would be lost.
Current Program Alternative	Direct control. Technical assistance. Supporting research.	APHIS ADC personnel would conduct direct control. APHIS ADC personnel would provide technical assistance. APHIS ADC would provide research support through the DWRC.	Funded by APHIS ADC appropriations and cooperative funding.	Uses an Integrated Pest Management (IPM) approach to wildlife damage control.
Nonlethal Control Program Alternative	Direct control only using nonlethal methods. Technical assistance with nonlethal methods only. Research to support nonlethal methods only.	APHIS ADC personnel would conduct nonlethal control. APHIS ADC would provide nonlethal technical assistance. APHIS ADC would provide nonlethal research support through DWRC. State agencies and/or individuals might assume new or greater responsibility for wildlife damage control.	Funded by APHIS ADC appropriations and cooperative funding.	APHIS ADC would provide technical assistance and nonlethal direct control as part of a modified IPM approach limited to the use of nonlethal methods. Considerable damage caused by wildlife would occur. Would be biologically and economically impracticable. Where nonlethal methods are impractical or ineffective, APHIS ADC would provide no wildlife damage control.

(Continued)

Table 2-1 (Continued)

Alternatives Based on Public Scoping and Assessment of Issues Affecting the Current APHIS ADC Program

Alternatives Considered	APHIS Actions Taken Under Alternative	Agencies/Individuals Responsible for Administration and Application	Funding Considerations	Other Aspects of This Alternative
Nonlethal Before Lethal Control Program Alternative	Direct control. Technical assistance. Supporting research.	APHIS ADC personnel would conduct nonlethal before lethal control. APHIS ADC would provide nonlethal before lethal technical assistance. APHIS ADC would provide both nonlethal and lethal research support through DWRC. State agencies and/or individuals might assume new or greater responsibility for wildlife damage control.	Funded by APHIS ADC appropriations and cooperative funding.	APHIS ADC would use a modified IPM approach, recommending or applying all practical nonlethal control methods prior to implementing lethal control methods. Wildlife damage would continue while some nonlethal methods were tried. Would be biologically and economically impracticable. Criteria needed to determine when direct control may be applied.
Damage Compensation Program Alternative	No direct control. No technical assistance No supporting research. APHIS ADC efforts directed at verification and compensation of agricultural crop and livestock losses only.	APHIS ADC personnel would administer a compensation program for agricultural crop and livestock losses only. State agencies and/or individuals might assume new or greater responsibility for wildlife damage control.	All APHIS ADC funds would be directed to damage verification and compensation. Compensation costs would likely exceed present funding. Compensation at full value of losses would require substantial additional appropriations.	This alternative ignores wildlife damage to nonagricultural resources and facilities, public health and safety, and other wildlife. This alternative does not attempt to reduce wildlife damage. Considerable wildlife damage would occur.
Direct Control Only, With Supporting Research Alternative	Direct control. No technical assistance. Research to support direct control only.	APHIS ADC personnel would conduct direct control and supporting research. State agencies and/or individuals might assume new or greater responsibility for wildlife damage control.	The direct control program would be funded by APHIS ADC appropriations and cooperative funds. Cooperative funding might increase. Less damage control would be provided with funding equivalent to present program.	The direct control methods available to APHIS ADC would be the same as those under the Current Program alternative. This alternative would eliminate APHIS ADC programs in many States that are technical assistance only.

(Continued)

Table 2-1 (Continued)

Alternatives Based on Public Scoping and Assessment of Issues Affecting the Current APHIS ADC Program

Alternatives Considered	APHIS Actions Taken Under Alternative	Agencies/Individuals Responsible for Administration and Application	Funding Considerations	Other Aspects of This Alternative
Technical Assistance Only, With Supporting Research Alternative	No direct control. Technical assistance. Research to support technical assistance.	APHIS ADC personnel would conduct technical assistance and supporting research. State agencies and/or individuals might assume new or greater responsibility for wildlife damage control.	The technical assistance program would be funded by APHIS ADC appropriations and cooperative funds. Cooperative funds would decrease.	The technical assistance methods available to APHIS ADC would be the same as those under the Current Program alternative. This alternative would eliminate a major part of present APHIS ADC programs in many States.
Conversion of Direct Control Programs to Education and Technical Assistance With Transfer of Funds and Responsibilities to the USDA Extension Service Alternative	No direct control. Technical assistance transferred to a different USDA agency. No wildlife damage control research.	The USDA ES would conduct technical assistance activities for wildlife damage control. The USDA ES would continue to provide educational programs dealing with wildlife damage.	The USDA ES would receive all APHIS ADC funding currently appropriated to APHIS ADC. Cooperative funding would decrease.	Technical assistance would be the only form of wildlife damage control offered under this alternative.
Reduction of Federal Manpower and Transfer of Federal Control Operations to Private Contractors Alternative	No direct control. No technical assistance. No wildlife damage control research.	APHIS ADC personnel would provide contract oversight only. Contractors would provide direct control, technical assistance, and research.	Private contractors would receive APHIS ADC funding for control activities and research. APHIS costs for contract administration would come from APHIS ADC appropriations.	Damage control methods would be selected by contractors from whatever methods were legally available, subject to contract limitations.
Transfer of Present Program, Including Funds, to State Wildlife Management Agencies Alternative	No direct control. No technical assistance. No wildlife damage control research.	Individual States would administer wildlife damage control, including direct control, technical assistance, and research.	APHIS appropriations would be transferred to State agencies.	This alternative could not be implemented unilaterally but would depend on the willingness of the individual States to administer a wildlife damage control program.

(Continued)

Table 2-1 (Continued)

Alternatives Based on Public Scoping and Assessment of Issues Affecting the Current APHIS ADC Program

Alternatives Considered	APHIS Actions Taken Under Alternative	Agencies/Individuals Responsible for Administration and Application	Funding Considerations	Other Aspects of This Alternative
Continuation of Western Coyote Work at APHIS; Transfer of Eastern Bird Work to the USFWS Alternative	Direct control of coyote damage in the Western States. Technical assistance for coyote damage control in the Western States. Supporting research for western coyote control. No direct control of bird or coyote damage in the Eastern States. No technical assistance for bird or coyote damage control in the Eastern States.	APHIS ADC personnel would conduct direct control for western coyote damage. APHIS ADC personnel would provide technical assistance for western coyote damage. APHIS ADC personnel would provide research supporting western coyote damage control through DWRC. USFWS would conduct eastern bird damage control activities. State agencies and/or individuals might assume new or greater responsibility for wildlife damage control.	Western coyote work funded by APHIS ADC appropriations and cooperative funding. USFWS receives APHIS ADC appropriations and cooperative funding for eastern bird damage control activities.	This alternative inappropriately assumes the present program consists of only two parts: western coyote damage control and eastern bird damage control. This alternative ignores eastern coyote, western bird, and all rodent damage control, research, and other program activities. Legal authority would be required to assign all bird damage work to the USFWS.
Eradication Alternative	Direct control to eliminate specific pest wildlife populations. Technical assistance to eliminate specific pest wildlife populations. Research to focus on methods to eliminate specific pest wildlife populations.	APHIS ADC personnel would conduct direct control. APHIS ADC personnel would provide technical assistance. APHIS ADC personnel would provide research support through DWRC.	Funded by APHIS ADC appropriations and cooperative funds. This alternative would likely require more funds than the present program.	Would be biologically, economically, and legally impracticable, as well as socially unacceptable.
Suppression Alternative	Direct control for long-term suppression of target wildlife populations. Technical assistance for long-term suppression of target wildlife. Research to focus on methods for long-term suppression of target wildlife populations.	APHIS ADC personnel would conduct direct control. APHIS ADC personnel would provide technical assistance. APHIS ADC personnel would provide supporting research through DWRC.	Funded by APHIS ADC appropriations and cooperative funds. Costs may be similar to those of the eradication alternative.	Would be biologically, economically, and legally difficult, as well as socially unacceptable. Suppression would make concurrent use of lethal and nonlethal methods.

The alternatives eliminated from further detailed consideration in this EIS are discussed in the following section, followed by a detailed discussion of the No Action Alternative, Current Program Alternative, Nonlethal Control Program Alternative, Nonlethal Before Lethal Control Program Alternative, and Damage Compensation Program Alternative.

C. Alternatives Not Presented in Detail or Rejected in This EIS

Following evaluation of the complete list of alternatives formulated for this EIS, it was determined that several should be eliminated from detailed consideration. Some simply could be eliminated because they failed to satisfy the constraints listed previously and were deemed infeasible. Others are viable decision options, but their environmental impacts are similar to those of the five alternatives that are considered in detail in this EIS. In the interest of clarity and brevity, as directed by the Council for Environmental Quality (CEQ) regulations, those similar evaluations are not repeated. The alternatives not assessed in detail in the EIS are identified in Table 2-2. In addition, the following discussion of each alternative provides the rationale for the summary provided in Table 2-2.

1. Direct Control Only, With Supporting Research Alternative

This alternative would eliminate all technical assistance activities currently performed by APHIS ADC program personnel. All State programs administered by APHIS ADC program personnel currently provide some level of technical assistance. In many States, particularly in the Eastern United States, the programs consist mainly of technical assistance activities. Therefore, this alternative would eliminate a large part of many current State programs.

Under this alternative only direct control would be provided, supported by research. Methods available to the APHIS ADC program under this alternative would presumably be the same as those available to the present program. Methods used for direct control are described in Appendix J.

Implementation of this alternative would cause the funds now spent on technical assistance to be spent on direct control, thereby increasing the availability of Federal funds to match cooperative contributions. Therefore, cooperative funding might increase. Because the costs to the APHIS ADC program are higher for direct control than for technical assistance, the Federal appropriation would reach fewer people and would achieve less damage control. Achieving the same level of damage control as the present program would cost more under this alternative.

The impacts of this alternative are not discussed separately in this EIS because direct control and related research are part of the Current Program Alternative. The impacts of providing less damage control are discussed under the No Action Alternative.

2. Technical Assistance Only, With Supporting Research Alternative

This alternative would eliminate direct control from the current APHIS ADC program. As indicated previously, some current APHIS ADC State programs primarily employ technical assistance to solve wildlife damage problems. This alternative would require that all APHIS ADC State programs shift to technical assistance only.

Table 2-2

Evaluation of Alternatives Considered in this EIS

Alternative	Evaluation	Treatment in this EIS
No Action Alternative	- Does not meet constraints.	Considered in detail in this EIS as required by CEQ regulations.
Current Program Alternative	- Meets constraints. - Represents a broad range of impacts covered in Chapter 4.	Considered in detail in this EIS.
Nonlethal Control Program Alternative	- Does not meet constraints. - Impacts of nonlethal control covered by Current Program alternative in instances where nonlethal control is practical, or No Action alternative where nonlethal control is impractical. - Not founded on sound biological principles. - Limited ability to address all damage problems. - Not economically feasible.	Considered in detail in this EIS as a response to comments.
Nonlethal Before Lethal Control Program Alternative	- Meets constraints. - Many impacts covered by current program alternative. - Not founded on sound biological principles. - May lead to illogical sequencing of method use.	Considered in detail in this EIS as a response to comments.
Damage Compensation Program Alternative	- Does not meet constraints. - Not economically feasible.	Considered in detail in this EIS as a response to comments.
Direct Control Only, With Supporting Research Alternative	- Meets constraints. - Impacts of direct control and research covered by Current Program alternative. - Impacts of less wildlife damage control covered by No Action alternative.	Not considered in detail in this EIS.
Technical Assistance Only, With Supporting Research Alternative	- Meets constraints. - Impacts of technical assistance and research covered by Current Program. - Impacts of less damage control covered by No Action alternative.	Not considered in detail in this EIS.
Conversion of Direct Control to Education and Technical Assistance With Transfer of All Funds and Responsibilities to USDA Extension Service Alternative	- Meets constraints. - Impacts of technical assistance covered by Current Program. - Impacts of no direct control or research covered by No Action alternative.	Not considered in detail in this EIS.

(Continued)

Table 2-2 (Continued)

Evaluation of Alternatives Considered in this EIS

Alternative	Evaluation	Treatment in this EIS
Reduction of Federal Manpower and Transfer of Federal Control Operations to Private Contractors Alternative	- Meets constraints. - Impacts would be similar to Current Program alternative.	Not considered in detail in this EIS.
Transfer of Present Program, including Funds, to State Wildlife Management Agencies Alternative	- Meets constraints. - Impacts would be similar to Current Program alternative.	Not considered in detail in this EIS.
Continuation of Western Coyote Work at APHIS; Transfer of Eastern Bird Work to USFWS	- Does not meet constraints. - Not a programmatic alternative. - Administratively cumbersome. - Arbitrarily piecemeals program.	Rejected from further consideration.
Eradication Alternative	- Does not meet constraints. - Not founded on sound biological principles. - Impracticable. - Socially unacceptable.	Rejected from further consideration.
Suppression Alternative	- Does not meet constraints. - Not founded on sound biological principles. - Socially unacceptable.	Rejected from further consideration.

The methods of wildlife damage control under this alternative would include all chemical and mechanical, lethal and nonlethal techniques currently supplied to or suggested to cooperators for their use. APHIS ADC personnel would not conduct actual control efforts. This alternative would continue to make technical assistance materials and techniques developed as a result of APHIS ADC research available to APHIS ADC program cooperators; however, it precludes APHIS ADC program personnel from using many of the methods currently employed under the IPM approach.

Under this alternative the funds now spent on direct control would be used on technical assistance. The same Federal appropriation would allow the program to reach more people, but the amount of damage control achieved would vary depending on the type of damage. For example, without direct control, damage by coyotes and beavers historically has not been controllable. If such control work were conducted by the affected individuals, the impacts would be similar to those described for individual actions under the No Action Alternative.

It is reasonable to assume that this alternative would be less popular with recipients of direct control services than the present program and not as well supported. The resulting loss of cooperative funds is one basis for concluding that the same Federal appropriation would achieve less damage control than the present program.

The impacts of this alternative are not discussed separately in this EIS because technical assistance and related research are part of the Current Program Alternative. The impacts of providing less damage control are discussed under the No Action Alternative.

3. Conversion of Direct Control to Education and Technical Assistance With Transfer of All Funds and Responsibilities to the USDA Extension Service Alternative

Under this alternative all direct control and research activities of the current APHIS ADC program would be eliminated. Technical assistance still would be administered by the Federal Government, but it would become the responsibility of a different agency within USDA. The Extension Service (ES) would receive all APHIS ADC funding currently appropriated to APHIS and would be responsible for all technical assistance, education program, and research activities related to wildlife damage control.

The ES works cooperatively with the APHIS ADC program throughout the nation. Formal Memoranda of Understanding (MOUs) and close working relationships already exist between the two.

Technical assistance would be the only form of wildlife damage control provided under this alternative. Materials and techniques supplied or suggested to cooperators by the ES under this alternative presumably would be similar to those provided in the present program. However, without the Denver Wildlife Research Center (DWRC), some methods (e.g., the use of pesticides for which DWRC provides data to maintain the registrations) may not be available for cooperator use.

This alternative differs from the previous alternative in two ways: (1) technical assistance would be performed by the ES rather than APHIS ADC (it is assumed that the information content would remain the same), and (2) APHIS ADC research would be abolished. Conclusions and assumptions from the previous alternative concerning the expected popularity of the alternative with cooperators and the program reaching more people but with varied results also apply to this alternative.

The impacts of this alternative are not discussed separately in this EIS. Technical assistance impacts are covered by the analysis for the Current Program Alternative. The impacts resulting from the lack of direct control and research are covered under the No Action Alternative.

4. Reduction of Federal Manpower and Transfer of Federal Control Operations to Private Contractors Alternative

Under this alternative the APHIS ADC program would not conduct direct control, technical assistance, or research. APHIS ADC program personnel would perform contract oversight only. All APHIS ADC activities, including research, would be performed by private contractors under contract to APHIS. Damage control methods would be selected by private contractors from whatever methods are legally available and authorized in contracts.

The same Federal appropriation available under the present program would achieve less damage control because some Federal employees would still be required to administer the contracts. Their costs would come from the appropriation, leaving less for

contracting. There also would be a reduction in efficiency, because there would be less continuity for long-term research and there would no longer be a central repository of research information with staff to disseminate the information. There presumably would also be less interchange of information and records.

This alternative retains all elements of the Current Program Alternative, but the work would be conducted by different people under the same set of wildlife and environmental protection laws. Therefore, environmental impacts would be similar to those of the Current Program Alternative and are covered by that analysis.

5. Transfer of Present Program, Including Funds, to State Wildlife Management Agencies Alternative

This alternative transfers APHIS wildlife damage control activities to State wildlife agencies. The transfer of the present program, including funds, to State agencies would involve all field and administrative activities, including technical assistance and direct control. The States also would receive the funds currently appropriated for APHIS ADC research. Under this alternative the methods of wildlife damage control would be selected by each State. The methods selected probably would be highly variable among States depending on the needs and legal and political constraints. Unless the States cooperated with each other in chemical methods research and related registration activities, some pesticide registrations may be lost.

State wildlife management agency involvement in wildlife damage control activities varies substantially among the States. The investment of State resources may be more or less extensive than that of the corresponding APHIS ADC program in each State. Some State programs address types of wildlife damage and species not addressed by the APHIS ADC program. The transfer of APHIS ADC activities to States probably could not be accomplished unilaterally, as each State would have to be willing to assume these activities. Some State wildlife management agencies feel their present wildlife damage control programs are sufficient and may be unwilling to accept responsibility for activities presently included in the APHIS ADC program.

Although the outcome of this alternative is difficult to predict, it could result in minimal change in control activities by those States where present damage control activities are extensive and the transfer of the APHIS ADC program activities were accepted. Conversely, where State involvement is minimal and the transfer of APHIS ADC program activities was not accepted, wildlife damage control effectiveness could be reduced.

Cost of this alternative is presumed to equal the amount currently spent jointly by the States and the Federal Government for the cooperative APHIS ADC program. Overall, there may be some administrative cost savings involving the elimination of APHIS ADC regional and headquarters offices ($4,794,465 in FY 1988). These administrative funds could be redistributed among the States. The States also would have administrative costs, but it is assumed that the difference between Federal and State administrative costs would be small.

This alternative retains all elements of the Current Program Alternative; however, the work would be conducted by different people under the same set of wildlife and environmental protection laws. Therefore, the environmental impacts would be similar to those of the Current Program Alternative and are covered by that analysis.

6. Continuation of Western Coyote Work at APHIS; Transfer of Eastern Bird Work to USFWS Alternative

This alternative would transfer the bird damage control program with supporting research in the Eastern United States to the USFWS, leaving APHIS ADC with only coyote damage control and supporting research in the Western United States. The geographic boundaries are assumed to be the same as those dividing the current Eastern and Western APHIS ADC regions. It also is assumed that each agency would receive funding in proportion to present program expenditures for eastern bird work and western coyote work.

This alternative inappropriately assumes that the present program consists of only two parts, western coyote work and eastern bird work. This does not include all functions of the current APHIS ADC program; therefore, it does not satisfy the programmatic constraint of the alternatives criteria and is rejected from further consideration.

However, it should be noted that the environmental impacts of eastern bird control and western coyote control would be similar to those of the Current Program Alternative and are covered by that analysis. The impacts of no western bird control, no eastern coyote control, and no rodent control, along with associated supporting research, are covered by the analysis of the No Action Alternative.

7. Eradication Alternative

The Eradication Alternative would direct all program efforts toward planned, total elimination of specific pest wildlife populations. The entire focus would be on implementing technical assistance, direct control, and research to eliminate target wildlife populations in areas where damage has occurred or could occur. Under eradication, all applicable control methods would be used to achieve extermination. Lethal methods necessarily would predominate. These methods are described in Appendix J.

The present APHIS ADC program has employed an eradication approach to wildlife damage control on a very limited basis for particular situations involving the protection of threatened and endangered species (see Chapter 4). Eradication is a minor component of the present program. Although rarely used, it is important under the IPM approach. The Eradication Alternative differs from the Current Program Alternative primarily by precluding the APHIS ADC program from using many of the methods currently employed under the IPM approach. The current array of options would be replaced by a more restricted array aimed at a single strategy: eradication.

No matter how carefully chosen the eradication methods might be, it is doubtful that the damage control objectives could be completed with available funding. Eradication of an entire wildlife species or population is very difficult or nearly impossible to accomplish in most situations, with diminishing returns as the numbers of a target population are reduced. Animal populations often have compensatory mechanisms that make them resilient to high levels of control or removal. Eradication of an animal population to prevent or control damage, especially when only a few individuals may be causing the damage, would not be the most effective, economical, or acceptable approach. In addition, associated impacts on nontarget species would undoubtedly be much higher than those under the present program.

If implemented effectively, this alternative in many cases would violate basic principles regarding wildlife management and the maintenance of species diversity. Federal and State wildlife and environmental protection laws probably would prevent effective implementation of this alternative.

This alternative was eliminated from further consideration because it is impracticable, both biologically and economically. As the sole focus of the APHIS ADC program, it also would be socially unacceptable. Eradication could not be effectively implemented to accomplish the wildlife damage control mandate; therefore, the impacts of such a program are not further analyzed.

8. Suppression Alternative

The Suppression Alternative would direct all program efforts toward planned, long-term reduction of certain wildlife populations. The Suppression Alternative would focus all APHIS ADC program technical assistance, direct control, and research on long-term suppression of targeted wildlife populations in areas where damage has occurred or could occur. Lethal control methods necessarily would be emphasized. This alternative differs from the present program primarily by precluding the APHIS ADC program from using many of the methods currently employed under the IPM approach.

The suppression of selected wildlife populations is one management strategy of the present APHIS ADC program, but it is not the focus of the entire program. In designated areas where damage attributable to wildlife historically has been high, preventive controls are used to suppress target populations. Suppression is used in conjunction with other methods (e.g., fencing, scaring, or other techniques) to prevent or minimize damage. The combination of methods is more effective in reducing losses than any one technique alone.

The methods that would be employed to suppress targeted wildlife populations would be the same technical assistance and direct control methods used in the present APHIS ADC program in situations where population suppression has been an objective. All methods currently employed by the APHIS ADC program are described in Appendix J.

The costs of implementing the Suppression Alternative may be similar to the costs of an Eradication Program Alternative. The cost could be either (1) that amount appropriated for the current APHIS ADC program, or (2) the amount that it actually takes to implement a suppression approach to wildlife damage control.

Suppressing target wildlife populations to below carrying capacity over large areas on a sustained basis would be very labor intensive and costly. It would require a constant effort to keep wildlife populations from growing or immigrating into areas where the supply of food and shelter is adequate to support larger populations. The effort required to suppress the natural tendencies of wildlife to increase populations to carrying capacity could cause costs for implementing suppression to be very high.

Suppression of local wildlife populations is an important part of the present APHIS ADC program. However, suppression alone may not effectively control many wildlife damage problems and may not be practicable for many species and situations. The costs and associated impacts of suppression alone would be higher than those of the present program to achieve equivalent levels of damage control. Depending on the level of suppression needed to reduce damage, Federal and State wildlife and environmental protection laws could prevent effective implementation of this alternative.

The Suppression Alternative was eliminated from further consideration because it is impracticable, both biologically and economically. As the sole focus of the APHIS ADC program, it also would be socially unacceptable. Suppression could not be effectively implemented to accomplish the wildlife damage control mandate; therefore, the impacts of such a program are not further analyzed.

D. Alternatives Evaluated in Detail in This EIS

1. No Action Alternative

An assessment of the No Action Alternative is required under CEQ Regulations on Implementing National Environmental Policy Act Procedures (40 CFR 1502.14(d)). Under certain circumstances, the No Action Alternative involves a "no change" approach to the action being studied in the EIS; in other situations, it involves a "do nothing at all" approach. For the purposes of this EIS, No Action Alternative is considered a "do nothing at all" approach. Under this alternative there would be no APHIS ADC program administered or funded by APHIS and no technical assistance, direct control, or research undertaken by APHIS for the purposes of wildlife damage control.

APHIS would be disassociated from all wildlife damage control activities under the No Action Alternative. It is likely that certain functions of the present APHIS ADC program would be conducted by other Federal, State, and local agencies, or by individuals. Because many Federal, State, and local agencies are cooperators with the present APHIS ADC program, a greater rather than a new responsibility for wildlife damage control might be assumed by these agencies. The activities that probably would be conducted by Federal agencies include certain public health and safety protection measures (e.g., airport protection), protection of threatened and endangered species, and wildlife damage control to protect public forests and rangelands.

In response to public demands, State agencies would likely continue or establish a State-administered wildlife damage control program using State manpower, or implement some form of bounty program. They also might choose to contract wildlife damage control functions to private pest control operators or establish some form of compensation for losses.

More resource managers might implement wildlife damage controls as part of the cost of doing business in an enterprise affected by wildlife damage. Under No Action Alternative, wildlife damage control responsibilities would be assumed only if the affected agencies or individuals choose to do so. Their choice would be based on circumstances that would vary among locations.

The various situations presented in this EIS are in no way intended to encompass all possible outcomes under this alternative. Rather, they are considered representative of what could realistically occur. There probably would be various combinations of agency and individual wildlife damage controls occurring simultaneously, depending on the circumstances, and many individuals probably would be left to handle wildlife damage problems on their own. Even with the implementation of Federal, State, and local agency programs , some individuals would feel the need to increase their damage control efforts.

Implementation of wildlife damage control methods could be influenced by laws and regulations, producers' tolerance of damage and their ability to absorb losses, and public demand for controlling wildlife damage to public and private structures, facilities, and other areas (e.g., public parks and recreation areas).

Agencies or individuals might choose not to take action against wildlife damage. Therefore, no control methods would be employed. Other situations may warrant the use of legally available control methods because of public demand, mandates, or individual

preferences. In some cases, control methods could be employed contrary to their intended use (e.g., disregarding pesticide label use restrictions) or in excess of what is recommended or necessary.

Some currently available chemical control methods would be lost because of discontinued DWRC research under the No Action Alternative unless other groups take the initiative to fund or conduct necessary research to maintain chemical methods. Pesticide registrations required for the use of some chemicals would be difficult to maintain without the DWRC to provide EPA with data required to keep the registrations current. The loss of certain chemical control methods could reduce the effectiveness of wildlife damage control efforts or cause the use of other chemicals that could be more environmentally damaging.

Under the No Action Alternative, where other Federal, State, or local agencies choose to assume the responsibilities for wildlife damage control, the cost in terms of dollars spent on control could be minimal (because they choose to do nothing) or much higher than the present APHIS ADC program (because the lack of expertise may reduce the effectiveness, which in turn would require more effort and cost to achieve the same level of control). However, it is assumed that the cost of at least certain aspects of wildlife damage control, particularly those related to the protection of public health and safety, would be borne by government agencies and ultimately the taxpayer. In FY 1988 the APHIS ADC program spent $1,334,795 on health and safety activities. For a similar level of effort by other affected agencies, the costs could be similar.

In the case of individuals who choose to control wildlife damage, the costs also could range from minimal to much higher than the present APHIS ADC program. The same reasons noted for government agencies would apply, depending on what the producer or public is willing to accept in terms of damage or what they are able or willing to pay to reduce damage.

2. Current Program Alternative

The Current Program Alternative is the basis for comparison of the proposed APHIS ADC program alternatives because it represents the existing situation. The Current Program Alternative is described in terms of the activities and actions that occurred in FY 1988, which is considered a representative, "snapshot" year for the USDA APHIS ADC program since its transfer from the U.S. Department of Interior (USDI) USFWS in 1986. Chapter 1 provides a complete history of APHIS ADC program activities in the United States, including information regarding the transfer of the program to USDA APHIS.

The present APHIS ADC program is a collection of cooperative programs with other Federal, State, and local agencies and private entities. All activities are based on cooperative relationships, which require close cooperation and coordination. Program activities are conducted within authorizations received from the appropriate regulatory agencies and are highly variable among States, depending on laws and regulations, species involved, need, and available financial resources.

APHIS ADC program services are available to all U.S. citizens and institutions. However, the program does not work on all wildlife damage problems in every State. APHIS ADC activities at the State level may focus on only a few species or types of damage (e.g., predator damage to livestock) or may be broader-based to address many types of wildlife conflicts. In deciding the focus of its activities within each State, the State APHIS ADC program seeks to provide a leadership role which supplements or complements State and local wildlife damage management activities and to work jointly with cooperators in setting program priorities. These priorities are shaped largely by the purposes for which cooperative funds are provided. APHIS ADC efforts are largely directed

toward cooperative, cost-shared activities. Also, congressional appropriation bills frequently direct APHIS ADC to perform specific damage control activities or to devote financial resources to specific damage problems or research tasks.

MOUs are formal, nonfunding agreements that establish the framework governing APHIS ADC activities by defining responsibilities and establishing procedures for cooperation in areas of mutual interest. APHIS ADC presently operates under MOUs with the USDI USFWS and Bureau of Land Management (BLM); the USDA Forest Service (USFS) and ES; the U.S. Department of Transportation (USDOT) Federal Aviation Administration (FAA); and State wildlife management, agriculture, and health agencies.

Cost sharing is an integral component of the APHIS ADC program. Supervised and primarily funded by APHIS, most of the field activities are funded in part by other Federal, State, or local agencies; industry groups; or individuals requiring wildlife damage control assistance. Nonfederal employees are paid from cooperative funds and supervised by APHIS ADC. This permits APHIS ADC to extend its expertise and policies beyond the core group of Federal employees.

Funds for the APHIS ADC program are from APHIS appropriations, cooperative agreements, and other Federal funds. Funds are used for the protection of agricultural crops (including forest products and rangeland), aquaculture and mariculture, livestock, wildlife, urban and industrial facilities and structures, and public health and safety. Each of these protected resources, and APHIS ADC program activities and impacts related to these resources, are discussed in the Affected Environment and Environmental Consequences chapters (Chapters 3 and 4, respectively) of this EIS. Funding for FY 1988 is shown in Table 2-3.

Annual work plans are developed for cooperatively funded APHIS ADC program activities. These plans describe how the work will comply with applicable laws, regulations, and policies, and enhance, complement, or supplement related activities of other agencies or individuals. Work plans identify specific goals based on management objectives and policies of APHIS and cooperating agencies. Cooperators participate in the planning as well as the evaluation of program effectiveness.

Wildlife damage control is a field of specialization within the wildlife management profession. APHIS ADC program activities are developed and supervised by wildlife biologists who are knowledgeable of the ecological, economic, and sociological principles that govern wildlife management decisions. The APHIS ADC program supervises program activities through periodic field inspections and the issuance of Program Directives to ensure compliance with applicable laws, regulations, and policies. There are approximately 900 Federal, State, and cooperatively funded employees who make up the structure of the program. Figure 2-1 shows how the APHIS ADC program fits within APHIS, Figure 2-2 shows the structure of the Federal portion of the APHIS ADC program, and Figure 2-3 shows the locations of principal APHIS ADC program offices (national, regional, and State) and identifies multiple State jurisdictions (i.e., one APHIS ADC office responsible for more than one State).

In selecting control techniques for specific damage situations, consideration is given to the responsible species and the magnitude, geographic extent, duration and frequency, and likelihood of wildlife damage. Consideration also must be given to the status of target and potential nontarget species, local environmental conditions and impacts, social and legal aspects, and relative costs of control options. The cost of control is often a secondary concern because of the overriding environmental, legal, and animal welfare considerations. These factors are evaluated in formulating control strategies that incorporate the application of one or more techniques. The APHIS ADC decision model (see p. 2-26) and the examples in Appendix N illustrate how these factors may be taken into consideration in response to specific situations. Control services may be provided through technical assistance or direct control.

Technical assistance consists of APHIS ADC personnel providing verbal or written advice, recommendations, information, demonstrations or training, and distributing literature and materials for others to use in managing wildlife damage problems. Technical assistance is usually provided following an on-site visit or verbal consultation to determine the nature and history of the problem, extent of damage, and identification of the species responsible for damage.

APHIS ADC personnel may suggest the use of nonlethal, lethal, or a combination of techniques in resolving wildlife damage conflicts. Nonlethal recommendations may include, but are not limited to, habitat modification and manipulation, scaring devices, behavioral modification, exclusion devices and physical barriers, visual and olfactory repellents, live capture, translocation, guarding animals, and animal husbandry. Lethal methods recommended in technical assistance include traps and other capture devices, shooting, removal or destruction of eggs and/or nests, and chemical toxicants. For a detailed discussion of control methods, see Appendix J.

Table 2-3

APHIS ADC Expenditures and Funding Sources, FY 1988

	Funding Source			
Expenditure	**APHIS/ADC**	**Non-Federal Cooperator**	**Federal Cooperator**	**Total**
Agricultural Crops	$2,599,931	$1,431,335	$12,343	$4,043,609
Aquaculture	154,885	0	0	154,885
Livestock	9,299,934	8,871,282	14,073	18,185,289
Wildlife	295,360	315,104	180,811	791,275
Facilities and Structures	968,380	716,229	5,369	1,689,978
Health and Safety	825,336	436,075	73,384	1,334,795
Contract and Matching Funds Not Reported by Category	127,500	127,500	0	255,000
Subtotal	14,271,326	11,897,525	285,980	26,454,831
Administration (East and West Regional Offices, Washington Offices)	4,794,465[a]	0	0	4,794,465
Denver Wildlife Research Center[b]	5,636,575	78,258	757,554	6,472,387
Subtotal	10,431,040	78,258	757,554	11,266,852
Total	**$24,702,366**	$11,975,783	$1,043,534	$37,721,683

[a] Includes $1 million for preparation of an EIS.
[b] In FY 1988, DWRC was administratively a component of APHIS Science and Technology but was primarily funded from congressional appropriations to APHIS for wildlife damage control.

Figure 2-1 **Organization of USDA, APHIS, May 1992**

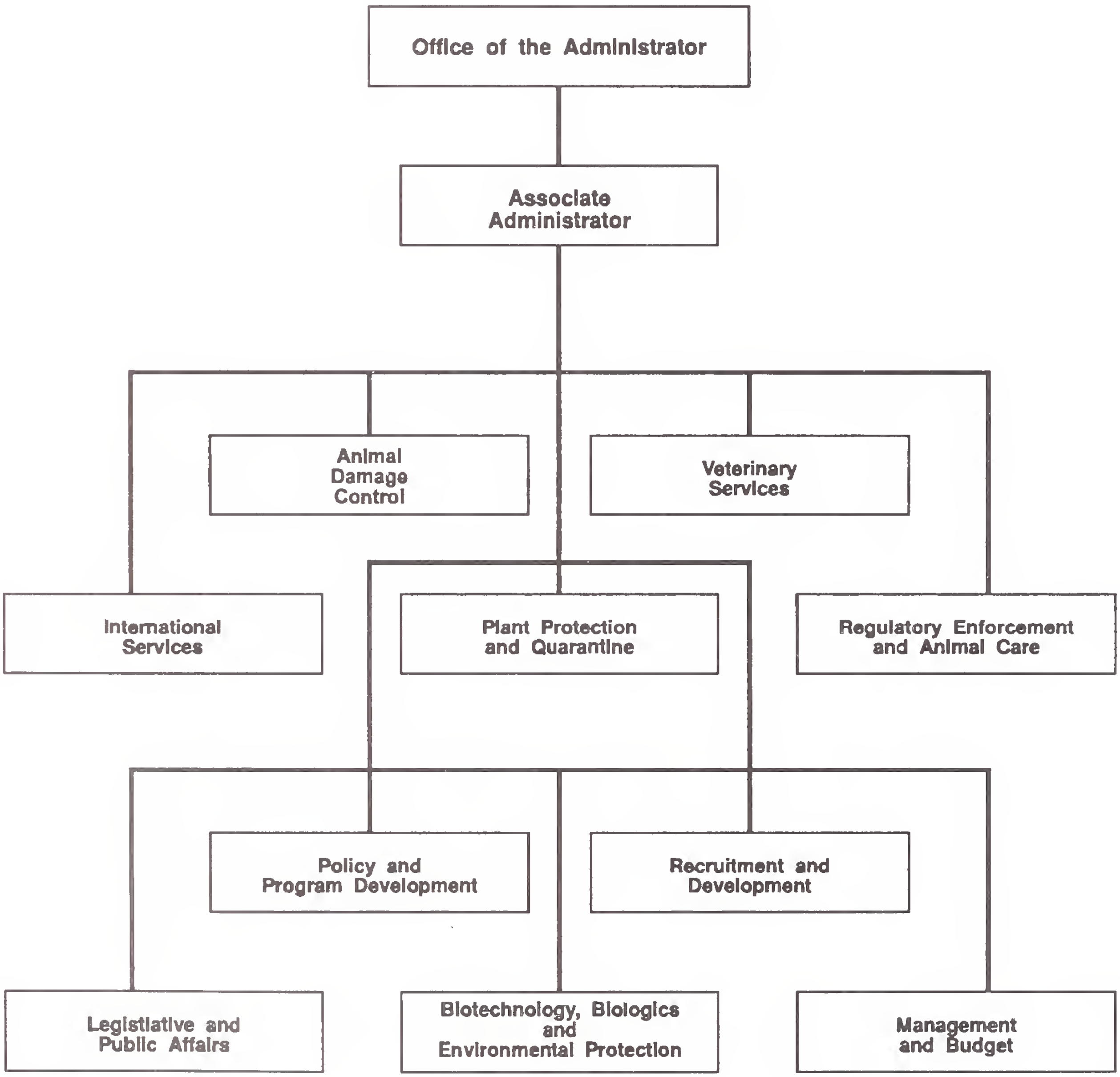


Figure 2-2 **Organization of USDA, APHIS ADC Program, May 1992**

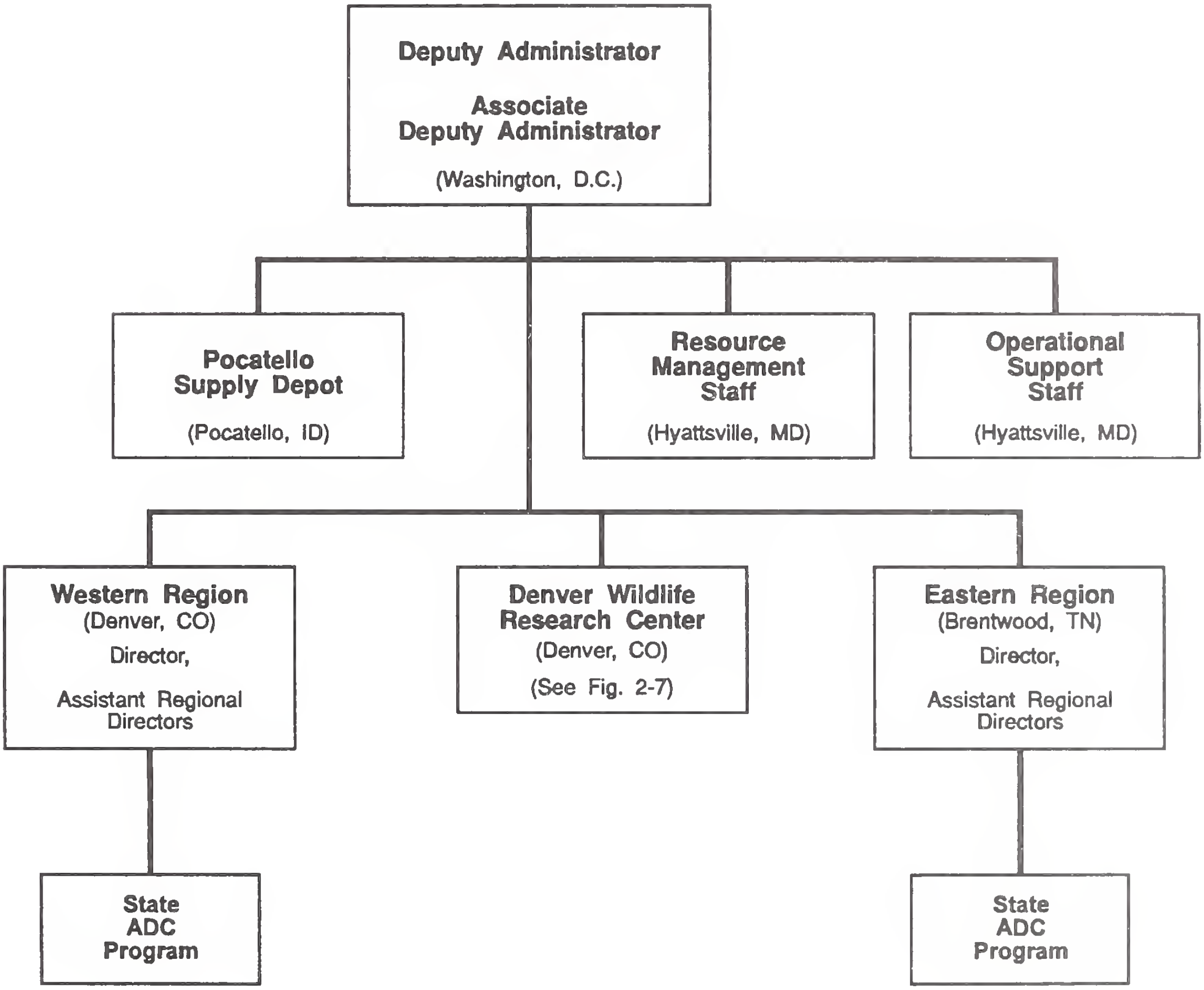
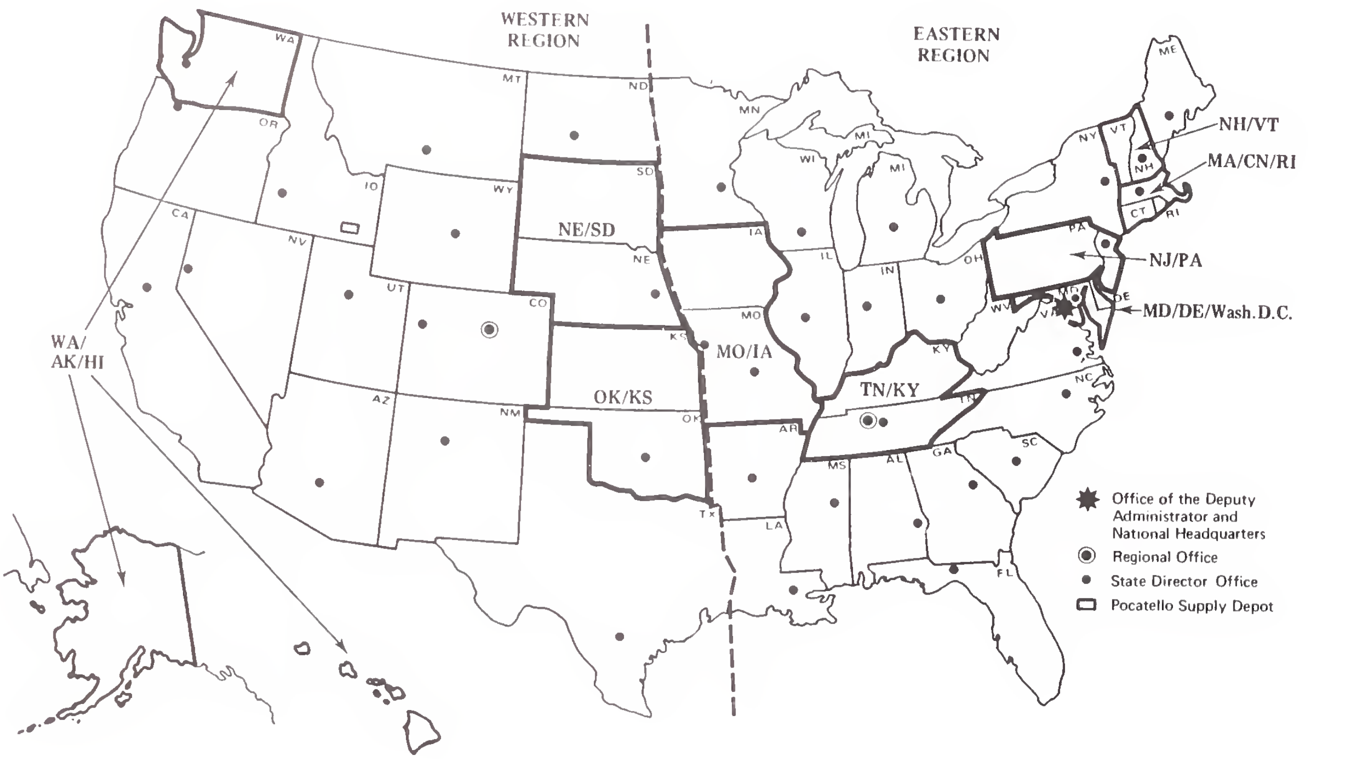


Figure 2-3 **Principal Office Locations and Multiple State Jurisdictions of the APHIS ADC Program, May 1992**



Explanation of the biology, behavior, and population ecology of the species responsible for damage occasionally is sufficient to satisfy the resource owner's information needs, and may result in no damage control actions being taken. Technical assistance normally includes suggestions for both short- and long-term solutions to damage problems.

Recipients of technical assistance receive detailed and complete information from APHIS ADC or the appropriate regulatory agency regarding legal and responsible methods of control. This includes application procedures as well as the biological and environmental impacts of these methods. All pesticides recommended by APHIS ADC personnel are registered by the Environmental Protection Agency (EPA) for the recommended uses and, when used as directed, comply with Section 7 of the Endangered Species Act. Technical assistance may require substantial APHIS ADC program effort to provide advice and training to the recipient of program services. However, the recipient of technical assistance is responsible for implementation of control actions. The APHIS ADC program does not control the actions, if any, taken by others.

Direct control is conducted by APHIS ADC personnel in the field. It typically consists of identification of the source of the problem and implementation of practical control actions. Direct control is usually provided when the resource owner's efforts, such as resource management or physical exclusion, are ineffective and technical assistance alone is inadequate. Cooperative funding is usually provided by the resource owner, an industry association, the State, or a local governmental agency. APHIS ADC personnel consider practical methods for resolving wildlife damage problems and take action by

Instruction in identification of predator kills is an important APHIS ADC technical assistance task.

implementing the most strategically appropriate measures. As mentioned previously, specific authorization from Federal, State, or local regulatory agencies may be required prior to some APHIS ADC direct control activities. These activities require much closer coordination than is necessary for technical assistance alone. Methods used by the APHIS ADC program are discussed in Appendix J.

Wildlife damage control education also is an important element of APHIS ADC program activities. In addition to the routine dissemination of recommendations and information to individuals or organizations sustaining damage, lectures and demonstrations are provided to farmers, homeowners, and other interested groups (e.g., university students, pesticide applicators, and government agency personnel). APHIS ADC frequently cooperates with ES and State agencies in education and public information efforts. Additionally, technical papers are presented at professional meetings and conferences so that APHIS ADC personnel and other wildlife professionals are periodically updated on recent developments in damage management technology, laws and regulations, and agency policies.

Program personnel and activities undergo periodic field inspections to ensure compliance with applicable laws, regulations, and policies. In addition to implementing an IPM approach to wildlife damage management and complying with all applicable Federal, State, and local laws and regulations, APHIS ADC personnel are guided by the following standard operating procedures:

- APHIS ADC routinely consults with USFWS, Federal land management agencies, and State wildlife management or natural resource agencies regarding program impacts. For example, APHIS ADC has consulted USFWS under Section 7 of the Endangered Species Act in the preparation of this EIS, and the USFWS Biological Opinion is included in Appendix F. USFS and BLM are cooperating agencies in the development of this document.
- The APHIS ADC program is conducted under MOUs with other Federal and State agencies. These define working parameters and responsibilities of participating agencies.
- Program techniques and activities are performed with consideration to public health and safety.
- Control methods used by the APHIS ADC program are as species-specific as possible, thereby minimizing hazards to nontarget species.
- Research is conducted by the APHIS ADC program to develop control methodologies that are more effective and species selective.
- USDA APHIS has established a National Animal Damage Control Advisory Committee to provide advice to the Secretary of Agriculture on policies and issues of concern to the national APHIS ADC program. The committee is composed of 20 individuals representing varied interests, including agricultural producers, environmental and animal welfare organizations, and academic institutions.
- The APHIS ADC program uses a management information system (MIS) and other database management systems to assist in the assessment of program activities and impacts.

The assessment of the impacts of the present APHIS ADC program (presented in Chapter 4) includes consideration of these standard operating procedures. A more detailed description of these procedures is presented in Chapter 5.

a. Operations

The present APHIS ADC program uses an IPM approach to reduce wildlife damage. The Council for Agricultural Science and Technology (1982) defines IPM as "the joint use of two or more tactics in a compatible manner to maintain the population of one or more pests at acceptable levels in the production of food and fiber while providing protection against hazards to humans, domestic animals, plants, and the environment." The IPM approach to pest control began as a way of curbing the single-tactic approach of using pesticides to control insects during the 1960s and 1970s and is well established and respected internationally. However, some parameters may be inappropriate in wildlife management. Marsh (1982) cautions against blindly "emulating the entomologist, for many of their principles and parameters are not applicable to vertebrate pest control problems." The most notable approaches, which cannot always be applied to vertebrate problems, are the use of introduced diseases, predators, and habitat modification (Timm 1984).

The introduction of disease into a wildlife population may be neither biologically nor socially acceptable. A similar argument may be made against the introduction of one wildlife species to prey on and control another wildlife species. Habitat modification is appropriate for some species, such as rodents and some birds, but may not be feasible for many other species of birds or larger mammals with sizeable territories or home

ranges. IPM for insect pests assumes that an economic threshold should be determined for each population (i.e., the population level of a pest below which the cost of control is higher than the alternative losses); however, this is rarely practical for damage by vertebrate animals. Timm (1984) points out that it is difficult and sometimes impossible to census vertebrate populations, and that population density does not always dictate damage.

The most effective approach to resolving wildlife damage problems is to integrate the use of several methods, either simultaneously or sequentially. IPM, as used in the APHIS ADC program, is the integration and application of practical methods of prevention and control to reduce damage by wildlife while minimizing harmful effects of control measures on humans, other species, and the environment. The IPM approach used by the APHIS ADC program consists of three action approaches: resource management, physical exclusion, and wildlife management. Each of these action approaches is a general strategy for addressing animal damage situations. Within each approach there are available a number of specific methods or tactics, as outlined in Table 2-4. Selection of the appropriate approach and method is the result of the APHIS ADC decisionmaking process outlined in Figures 2-4 and 2-5. The APHIS ADC program is aware of the limitations of IPM as applied to vertebrate damage, yet believes that the multiple-tactic approach is most appropriate. During more than 70 years of addressing wildlife problems, APHIS ADC operations and research have considered and attempted innumerable means of controlling damage. The techniques currently used represent the best technology that has evolved from this continuing process of method development and refinement.

b. APHIS ADC Decision Model

APHIS ADC personnel receive requests for assistance that encompass the broad range of wildlife damage problems. Some requests are relatively simple with straightforward solutions. Excluding squirrels from bird feeders or raccoons from chimneys represent typical examples. Requests for assistance to protect endangered species or human safety at airports are examples of more challenging problems in which a high level of interest is shown by various groups, organizations, and agencies. Unlike the previous squirrel and raccoon examples, the formulation, implementation, and success of an IPM strategy is frequently contingent on highly coordinated and cooperative efforts with many parties.

Each request for assistance is unique regardless of its complexity. Therefore, the decisionmaking process must be predicated on consideration of the specific biologic, sociocultural, economic, physical, and other environmental circumstances associated with a given wildlife damage problem. Ideally, a variety of methods should be available for the decisionmaker to formulate an effective IPM strategy (Table 2-4). Access to a variety of methods allows field personnel greater flexibility and a better opportunity to formulate an effective strategy for each specific request for assistance.

The decisionmaking steps APHIS ADC personnel take are fundamentally the same as those described in Chapter 1 for other professionals (Figure 1-1). The APHIS ADC decision model presented in Figure 2-4 is a more detailed version of the general professional action model (Figure 1-1) that was specifically developed to depict the APHIS ADC decision process. The compartment entitled "Evaluate Wildlife Damage Control Methods" from the APHIS ADC decision model (Figure 2-4) has been expanded to show the important factors given consideration at this step (Figure 2-5). The APHIS ADC decision model can be applied to the other program alternatives. Control methods selected under each alternative could be screened and evaluated leaving the wildlife manager with the best solution under the constraints of the alternative. Some methods available for evaluation and consideration in the formulation of control strategies are listed in Table 2-4. Representative, detailed examples of types of requests for assistance received by the APHIS ADC program have been developed to further demonstrate some

Table 2-4

Control Methods for Damage Caused by Selected Wildlife Species

Control Method	Badger	Black Bear	Bobcat	Coyote	Gray Fox	Red Fox	Mountain Lion	Opossum	Raccoon	Striped Skunk	Beaver	Nutria	Porcupine	Prairie Dog	Blackbirds	Cattle Egret	Starling
Resource Management																	
Animal Husbandry																	
Night Penning		•	•	•	•	•	•		•								
Shed Lambing		•	•	•		•			•								
Time of Breeding				•		•											
Move Livestock		•	•	•		•	•		•								
Change Class of Livestock	•	•	•	•	•	•	•		•								
Herding		•	•	•		•	•										
Guarding Animals		•	•	•	•	•	•										
Crop Selection and Planting Schedules																	
Time of Harvest				•		•									•		
Time of Planting				•		•									•		
Damage Resistant Varieties		•													•		
Change Crop	•	•		•	•				•				•		•		•
Habitat Management																	
Architectural Design		•						•	•	•							•
Modification of Human Behavior																	
Eliminate Wildlife Feeding		•		•				•	•	•							
Eliminate Wildlife Handling		•						•	•	•							•
Alter Aircraft Flight Patterns															•	•	
Physical Exclusion																	
Fencing		□	•	•	•	•			•	•							
Sheathing (hardware cloth, solid metal, chain link)																	
Tree Protectors		•									•		•				
Entrance Barricades			•	•	•	•		•	•	•							•
Netting															•		•
Porcupine Wire (Nixalite), etc.															•		•
Wire Grid															•		
Other																	
Close Storage Containers		•						•	•	•							
Wildlife Management																	
Habitat Management																	
Eliminate or Modify Vegetation															•	•	•
Eliminate Standing Water															•	•	•
Roost Thinning/Removal															•	•	•
Close Garbage Dump		•													•	•	•
Manipulation of Water Level											□	•			•		
Dam Removal (Beaver)											□						
Lure Crops/Alternate Foods																	
Food Plantings to Hold Birds															•		
Crops Sacrificed to Birds															•		
Grain Piles to Attract Birds															•		
Goats Sacrificed to Protect Sheep				•													
Frightening Devices																	
Electronic Distress Sounds															□	□	□
Propane Exploders		•		•	•	•									□	□	□

(Continued)

Table 2-4 (Continued)

Control Methods for Damage Caused by Selected Wildlife Species

Control Method	Badger	Black Bear	Bobcat	Coyote	Gray Fox	Red Fox	Mountain Lion	Opossum	Raccoon	Striped Skunk	Beaver	Nutria	Porcupine	Prairie Dog	Blackbirds	Cattle Egret	Starling
Pyrotechnics		●													□	□	□
Lights		●	●	●	●	●	●										
Water Spray Devices															□	□	□
Harassment (boats, planes, autos, atv's)				●	●	●									□	□	□
Other Scaring Devices																	
Strobe-siren		□		□	□	□											
Eye-spot Balloons															□	□	□
Effigies (owl decoys, scarecrows)				●	●	●	●								●		●
Chemical Repellents																	
Odor									●		●						
Tactile (Tanglefoot, etc.)															●		●
Frightening Agents (Avitrol)															□		□
Kill or Relocation Methods																	
Leghold Traps	□		□	□	□	□	□	□	□	□	□	□	□				
Cage Traps	□	□	□		□	□	□	□	□	□	□	□			□		□
Snares																	
Neck/Body	□		□	□	□	□		□	□	□	□	□	□				
Foot/Leg		□	□	□	□	□	□										
Catch-Pole	□		□	□	□	□		□	□				□				
Quick-kill Traps									□		□	□		□			
Denning				□	□	□											
Shooting																	
Aerial Hunting			□	□		□											
Calling and Shooting			□	□	□	□											
Spotlighting and Shooting			□	□	□	□		□	□	□	□	□					
Shooting on Sight	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□
Hunting Dogs/Shooting																	
Tracking/Trailing Dogs		□	□	□	□	□	□		□								
Decoy Dogs				□													
Egg and Nest Destruction																□	
Remove Hatchlings																□	
Chemical Toxicants																	
Aluminum Phosphide														□			
Zinc Phosphide												□		□			
Strychnine														□			
Sodium Cyanide				□	□	□											
Livestock Protection Collar (1080)				□													
Gas Cartridge				□		□								□			
DRC-1339															■		■
Starlicide															□		□
PA-14															■		■

Method Primarily Used By:

- ● Others, through technical assistance provided by APHIS ADC.
- ■ APHIS ADC employees.
- □ APHIS ADC employees and others.

Figure 2-4 **APHIS ADC Decision Model**

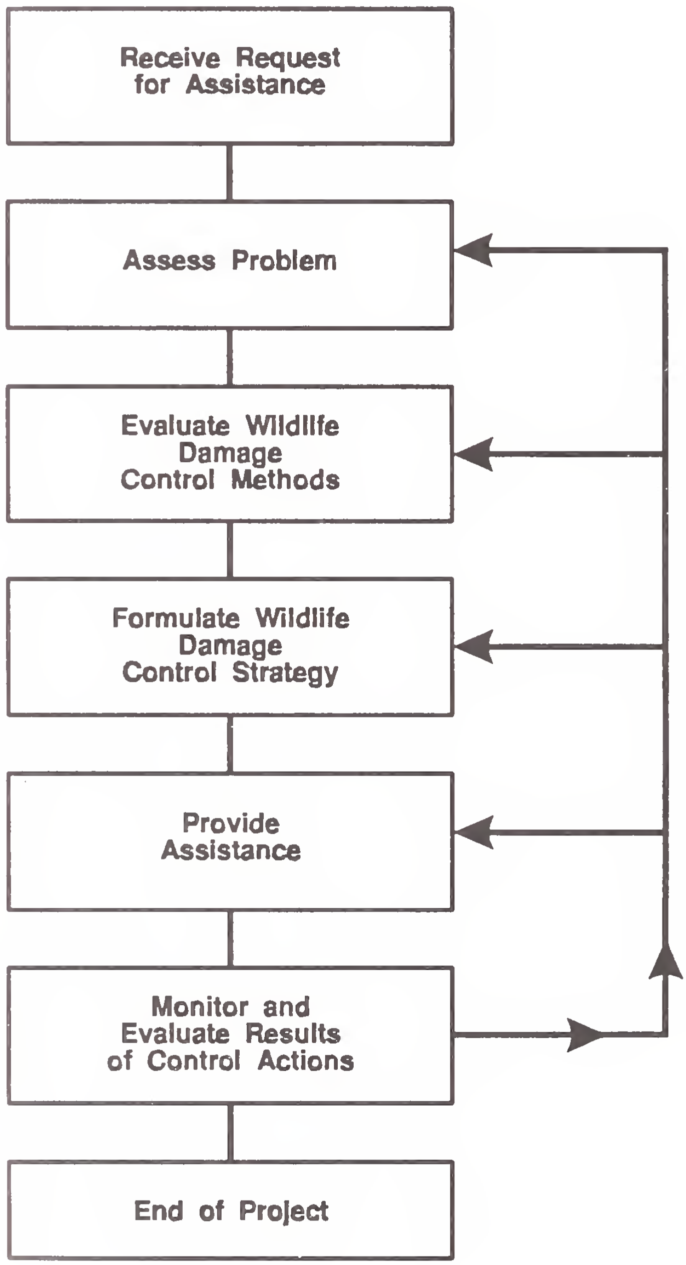
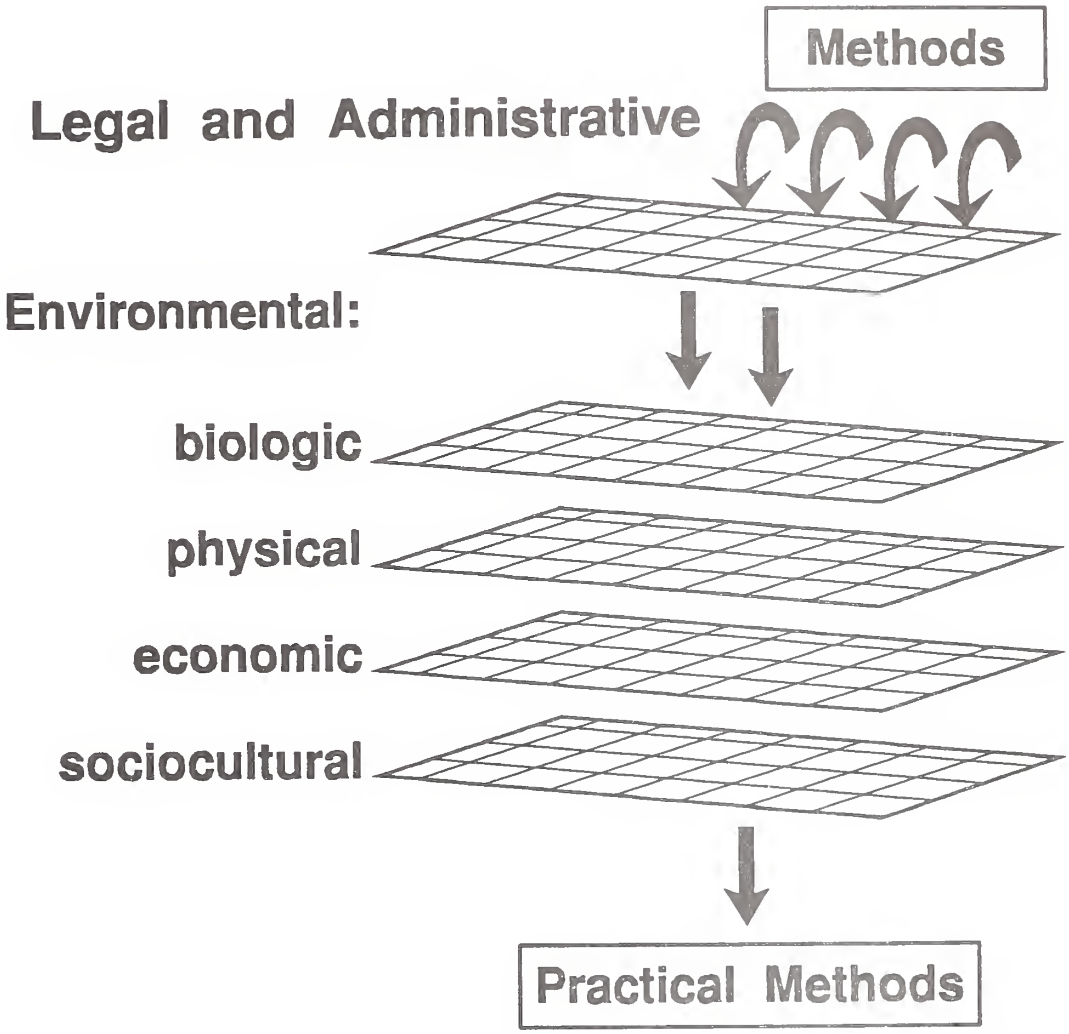


Figure 2-5 **Wildlife Damage Control Methods Screen**



of the complexities of formulating effective IPM strategies (Appendix N). The reader is encouraged to refer to these specific examples to gain a better understanding of the APHIS ADC decision process.

All Federal actions are subject to NEPA (Public Law 91-190, 42 U.S.C. 4321 et seq.). APHIS ADC complies with CEQ regulations implementing NEPA (40 CFR 1500 et seq.) and the APHIS Implementing Guidelines (7 CFR 372) as part of the decisionmaking process. The relationship of the NEPA process to APHIS ADC decisionmaking is shown in Figure 2-6.

Wildlife damage decision models can be useful management tools (Schmidt et al. 1985). They can serve as meaningful communication instruments as well. The decision model presented in Figure 2-4 is designed to serve as both these functions; however, it necessarily oversimplifies complex thought processes.

(1) Receive Request for Assistance

APHIS ADC is a service-oriented program that works on a request basis. Requests may be received by phone, in person, as referrals from others, or a variety of other means. Requests for assistance encompass a broad range of wildlife conflicts from nuisance wildlife in urban structures to more intricate problems, such as wildlife hazards to public safety, predation of livestock, or protection of endangered species.

(2) Assess Problem

Each request undergoes an initial assessment to determine if the problem is within the purview of APHIS ADC. Requests determined to be within the purview of APHIS ADC are subjected to a detailed assessment of the damage.

(a) Purview Determination

The diversity and scope of activities conducted by the APHIS ADC program is defined by Federal, State, and local laws, as well as MOUs and agreements. The purview of APHIS ADC varies among the 50 States in which the program is administered as a consequence of differences in State and local laws, MOUs, and agreements established with the APHIS ADC program in each State.

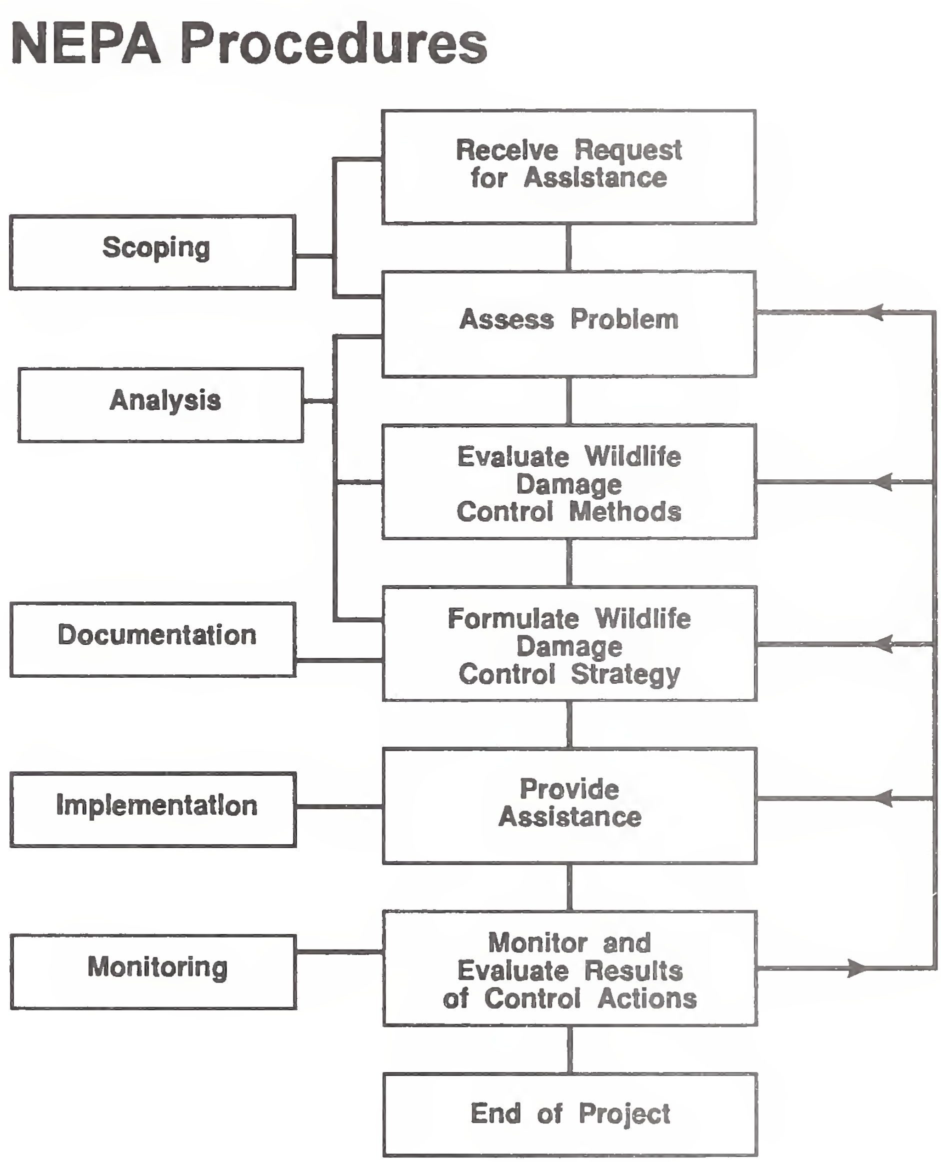
Most requests involving wildlife damage to agriculture, facilities and structures, or natural resources, or if wildlife pose a threat to public health and safety, result in APHIS ADC providing some type of wildlife damage management assistance. Requests to address problems that are clearly not within the responsibility or authority of the program in a State are usually referred to an appropriate source of assistance as a professional courtesy.

(b) Detailed Assessment of Damage

In assessing the damage, immediate attention is given to confirming that damage was caused by vertebrate animals, the species responsible for damage, and the type of damage (e.g., bird hazard at an airport, loss of livestock, or flooded crops). Commonly this requires an inspection, depending on the type and complexity of the problem. Then severity of the problem is considered in deciding which management options are potentially applicable. During inspections, damages normally are confirmed by APHIS ADC personnel.

The extent and magnitude of damage is also important in assessing current and potential economic losses in the absence of control. The resource manager or affected party is usually the source of this type of information. Pertinent aspects of the damage history are also relevant. For example, is this a recurring problem or is it the first episode of this type? What control actions, if any, have been attempted by the resource manager or affected party? What were the results? If no further control action is taken, is damage likely to continue or recur?

Figure 2-6 **Relationship Between APHIS ADC Decision Model and NEPA**



(3) Evaluate Wildlife Damage Control Methods

Once the problem assessment is completed, all available methods are evaluated for their practicality. Conceptually, this component of the APHIS ADC decision model consists of a series of legal, administrative, and environmental screens for each potential method (Figure 2-5). The result of this evaluation is one or more methods practical for further consideration in formulating alternative wildlife damage control strategies (see "Formulate Wildlife Damage Control Strategy" on p. 2-32).

A list of control methods for the 17 representative target species (analyzed in detail in Chapter 4) is provided in Table 2-4. To facilitate an understanding of the relative availability of control methods and who generally applies them, methods are organized under three action approaches to managing wildlife damage problems (Table 2-4).

One action approach is management of the resources susceptible to damage. It includes those activities designed to improve or modify current resource management practices, such as husbandry and cultural practices, as well as modification of human behavior. Application of these methods typically is the responsibility of the resource manager or affected party. However, APHIS ADC personnel make technical assistance recommendations concerning these methods.

A second action approach is placement of physical barriers to separate the resource that has sustained or is susceptible to damage from specific wildlife species. Fences, nets, and wire grids are examples of physical barrier methods. Like resource management methods, these are usually applied by the resource manager or affected party. APHIS ADC often makes technical assistance recommendations concerning the installation and improvement of physical barrier methods to reduce wildlife damage. APHIS ADC may also loan materials or demonstrate fencing or other physical exclusion methods.

A third approach, management of wildlife, includes habitat management, modification of wildlife behavior, and wildlife population management to reduce damage. Habitat management includes activities such as thinning trees from bird roosts or water level manipulation through removal of beaver dams, and is normally implemented by the resource manager or affected party. Modification of wildlife behavior includes the use of frightening devices, repellents, or lure crops. Population management includes translocation or lethal removal of wildlife from local populations. Behavior and population management methods may be conducted by either the resource manager, APHIS ADC personnel, or other wildlife damage control professionals, depending on legal and administrative considerations in each locale.

(a) Legal and Administrative Considerations

Wildlife damage control methods are subject to legal and administrative authorities. For example, a method may be legal in one State and not another. Or, a method may be legal only in portions of a State (e.g., not allowed in heavily populated areas). The status of the target species (State or federally listed as threatened or endangered), or the presence of listed species in the general area where control activities are proposed, may preclude the use of a method. The species may be a migratory bird, requiring a depredation permit in order to implement specific types of control actions. Also, the APHIS ADC program itself may restrict the use of specific methods by policy or agreement with other agencies or parties. Important questions that should be considered for each method during this phase of the assessment include:

- Is it legal, and administratively permissible to use the method on this species within the State where the request for assistance has been received?
- Is it legal, and administratively permissible to use the method to address this specific type of damage?

- If so, is it legal, and administratively permissible to use this method at the specific site for this request for assistance, or are there restrictions because of land class, other land use patterns, or the presence of listed species near the damage site?

All of the methods that pass these legal and administrative screens are available for further consideration in the decision process. It should be noted, however, that there are additional legal considerations with regard to who may apply (resource manager or affected party, APHIS ADC personnel, or others with expertise in wildlife damage management) methods considered under "Formulate Wildlife Damage Control Strategy" (see p. 2-32)

(b) Environmental Considerations

During this phase of the assessment, each legally and administratively available method is evaluated with regard to pertinent aspects of the biological, physical, sociocultural, and economic environments. A general question to be considered is: What are the positive or negative short- or long-term direct, indirect, or cumulative environmental effects of implementing or not implementing control action with the method? Other important questions that should be considered in making decisions about each method are listed below.

Biological Environment

- What is the population status of the target species? Is it endangered or threatened; or is it relatively abundant?
- Are there any threatened or endangered or other potential nontarget species in the area that could be affected either directly or indirectly in a positive or negative fashion by using the method?
- Are there any special behavioral traits of the target species, such as daily or seasonal movement patterns, that require consideration?
- Could the use of the method potentially affect biological diversity?

Physical Environment

- What effect would local weather or climatic patterns have on the use of the method?
- What effect would soil, water, air, elevation, or other physical habitat features have on the use of the method?
- What effect would the method have on soil, water, and air quality?
- What health and safety risks would the method pose to the applicator and the public?
- What health and safety risks would be posed to the public by not conducting control using the method?

Economic Environment

- Would the use of the method in this situation be likely to reduce damage?
- Does the magnitude of damage warrant the cost of applying the method?

Sociocultural Environment

Evaluating methods in the sociocultural environment frequently presents the greatest challenge because of differences in human attitudes toward wildlife species (Kellert 1976; Decker and Goff 1987), wildlife damage management methods (Stuby et al. 1979; Arthur 1981), and the resources damaged by wildlife (Connolly 1982). In spite of the difficulties associated with evaluating methods in the sociocultural environment, societal values are important in decisionmaking and they deserve similar consideration in methods evaluation as the other environmental factors. Some important sociocultural issues to consider in evaluating wildlife damage control methods include:

- What are the perceptions regarding the humaneness of the method?

- How acceptable would the risks of this method to nontarget animals be to the resource manager or affected party and the general public?
- How acceptable is the effect of each method on the target animal–no effect, frighten, exclude, modify habitat, translocate, or kill–to the resource manager or affected party and the general public?

The methods evaluation should result in one or more methods available for further consideration in formulating a control strategy (Figure 2-5). However, as a function of this evaluation it is possible to determine that there are no practical methods available. This results in no action being recommended or taken.

(4) Formulate Wildlife Damage Control Strategy

At this decision step, those control methods determined to be practical from the previous evaluation are formulated into a control strategy for the specific problem. In determining the sequence or combination of methods to be applied and who will apply them, preference is given to practical nonlethal methods. However, this does not mean that nonlethal methods must always be applied as a first response to each damage problem. Often the most appropriate response is a combination of nonlethal and lethal methods, and there will be instances where application of lethal methods alone is the most appropriate strategy.

(a) Strategy Considerations

Available Expertise

As previously discussed, some control methods are usually applied by the resource manager or affected party. Other methods can be used by resource managers or other professional wildlife damage control personnel, and still others may only be applied by APHIS ADC personnel.

The availability of expertise to address each specific request for assistance may influence the balance of technical assistance and direct control activities when formulating the IPM strategy. Relatively simple damage problems may be adequately addressed through technical assistance. However, effective solutions to many damage problems require an integration of those methods used by the resource manager with direct control services provided by the APHIS ADC program or other professional wildlife damage managers. The availability of APHIS ADC expertise for direct control to address complex damage problems is dependent on cooperative or congressionally directed funding. Cooperators are generally more inclined to provide funding for problems requiring special expertise than for those problems they can either solve on their own or through technical assistance. In addition, Federal and State legislators are more likely to appropriate public funds to solve problems requiring special equipment, materials, and expertise.

Legal Constraints on Method Users

Screening was previously performed (see "Legal and Administrative Considerations" on p. 2-30) to determine which methods were legally and administratively permissible for this problem. It is necessary here to consider any additional legal constraints on methods that define who may apply each method. The avicide DRC 1339, for example, can be used only by USDA personnel trained in bird damage control or persons under their direct supervision. Use of the livestock protection (LP) collar is restricted to specially trained and certified LP collar applicators who may be APHIS ADC employees (see Appendix Q).

Cost

Cost effectiveness is an obvious goal in wildlife damage management. However, the costs of implementing wildlife damage management cannot be considered independently from the damage problem, probable environmental impacts, and other strategy considerations.

The costs of methods and their application should be weighed against the severity of damage. Even in cases involving serious damage, lack of funds may constrain the resource manager or affected party from hiring special expertise adequate to solve the problem.

In relatively simple wildlife damage problems, such as excluding squirrels or raccoons from urban structures, the provision of technical assistance is usually sufficient and the least costly means of providing a solution. Difficult wildlife damage problems are usually not as easily or effectively resolved through technical assistance alone. For example, a livestock producer who is using all practical, state-of-the-art resource management and physical barrier methods may also require direct control assistance to successfully constrain continuing losses. In this scenario, the monetary costs for implementing an IPM strategy include both the costs of direct control applied by APHIS ADC and the costs incurred by the resource manager for implementing resource management and physical barrier methods.

Off-site or indirect benefits have to be considered as well. For example, the costs associated with the suppression of an offending coyote population at one location may be relatively high. But when costs are considered in the context of the benefit of avoided or continuing loss of sheep in neighboring areas, the costs of implementing the control strategy may be low.

Overriding social concerns often preclude the use of the most cost-effective methods. The use of pyrotechnic frightening devices in and around developed areas to reduce damage caused by birds may not be recommended or used because of noise, aesthetic, or other social concerns. Safe and effective lethal methods may not be used in a variety of circumstances primarily because of social considerations.

Short- and long-term costs and benefits of wildlife damage management strategies also are important. Methods such as the propane cannon have substantially higher initial costs in comparison to pyrotechnics, yet may be less expensive when labor is factored into the strategy budget.

Relative Effectiveness of Methods

Subject to other constraints and considerations previously discussed, APHIS ADC personnel attempt to recommend the most effective method or combination of methods to resolve problems. Effectiveness of a method or combination of methods must take into account the variables previously discussed, such as legal and administrative availability and practicality, as well as their monetary costs, negative environmental impacts, and most importantly their ability to reduce damage. Ideally, a method or combination of methods should be selected that produces maximum damage resolution with minimal negative environmental impacts (Owens and Slate 1991).

(5) Provide Assistance

APHIS ADC program service is delivered to the public by two basic means: technical assistance and direct control. Technical assistance is the provision of advice, recommendations, information, or materials for use in managing wildlife damage problems. Its emphasis is on helping others help themselves. Technical assistance may require substantial effort by APHIS ADC personnel in the decisionmaking process, but the actual control activities are the responsibility of the resource manager or affected party. Direct control is the implementation of control activities by APHIS ADC personnel in the field. Direct control is typically provided when funding is available and technical assistance alone is inadequate (see p. 2-17 through 2-20 for a more comprehensive description of technical assistance and direct control). Direct control by APHIS ADC or other appropriately trained wildlife personnel should be employed when actions may affect sensitive species or sensitive areas of the public domain or involve certain hazardous materials (Berryman 1972).

(6) Monitor and Evaluate Results of Control Actions

If control measures have been provided by APHIS ADC, it is usually necessary to monitor control actions to determine if they are achieving the desired results. Return site visits or telephone contacts with the resource manager represent the most common forms of monitoring conducted by APHIS ADC personnel. Site visits or phone contacts are also required to monitor equipment placed in the field by APHIS ADC personnel to assess if it is functioning properly, or to determine if any animals have been captured.

Monitoring control actions is an important step in determining if further assistance is required to responsibly address the problem. Monitoring also allows APHIS ADC personnel to know when to discontinue control activities, thus reducing unnecessary environmental impacts and monetary expenditures.

The need for additional assistance is usually identified through routine monitoring and evaluation of control actions by APHIS ADC personnel. If the recommended strategy is having an effect but damage has not abated, continuation of the strategy or reevaluation may be in order, as represented by the feedback loop shown in Figure 2-4.

(7) End of Project

A project is considered completed for APHIS ADC whenever program personnel are no longer directly involved in control activity for that specific problem. For many projects that are addressed through technical assistance alone, APHIS ADC involvement in the project ends when the recommendations or advice is provided to those making the request. Some direct control projects, such as the removal of a single family of beaver and the associated dams responsible for flooding a road or dispersing blackbirds from an urban roost, have well-defined end points. Other projects, such as chronic predation on livestock or at aquaculture facilities, may require continuing attention at various times of the year. These types of projects have no well-defined end points.

(8) Relationship of Key Activities in the NEPA Process to the APHIS ADC Decision Model

All Federal actions are subject to NEPA (Public Law 91-190, 42 U.S.C. 4321 et seq.). APHIS ADC will follow both the (CEQ) regulations implementing NEPA (40 CFR 1500 et seq.), USDA (7 CFR 1b), and the APHIS Implementing Guidelines (7 CFR 372) as a part of the decisionmaking process. These laws, regulations, and guidelines generally outline five broad types of activities that need to be accomplished as part of any project, scoping, analysis, documentation, implementation, and monitoring. The following sections discuss how these processes relate to the APHIS ADC decision model on specific areas or individual actions being conducted by the program (Figure 2-6).

(a) Scoping

The NEPA regulations require ". . . an early and open process for determining the scope of issues to be addressed and for identifying significant issues related to a proposed action." Within the APHIS ADC process, scoping may start well before most requests for assistance have arrived. APHIS ADC specialists and other personnel maintain an ongoing dialogue with cooperators, including other agencies, organizations, and private individuals. These contacts help to define the types and extent of services that might be requested as well as the issues that should be considered before providing assistance. When a request for assistance is received, the specialist (or other APHIS ADC personnel) has a general understanding of the problems and associated impacts of the potential actions that could address the request. The APHIS ADC representative asks questions and starts to define the scope of the possible actions and, if necessary, defines any associated new issues not already addressed in existing documents covering the action. Scop-

ing will continue, if the action so requires, in discussions with other relevant agencies, groups, or potentially affected individuals while APHIS ADC defines and assesses the situation. These discussions may lead to other activities, such as public meetings.

(b) Analysis

From a NEPA standpoint, sufficient analysis of potential effects is required to assist in decisionmaking and to determine the type of documentation that will be required.

While assessing damage, evaluating methods, and evaluating control strategies, APHIS ADC personnel consider, at least mentally, the issues and opportunities associated with the proposed actions. Based on training, experience, and available methods, the individual(s) then formulates one or more reasonable, effective strategies to address the request. These strategies are analyzed to determine the comparative environmental (economic, sociocultural, biological, and physical) effects of each of the alternatives. The strategies are then discussed, as appropriate, with affected and interested parties, and a decision is made on a course of action. A basic analysis is needed for every field decision, with some broader analyses being done at a higher level (district, State, region, or national offices).

(c) Documentation

Within the NEPA process decisions are defined by and through specific implementing guidelines and decision documents (records of decisions or RODs). Based on these documents, the program will have "decisions" concerning specific actions that will be covered, for NEPA purposes, by broader documentation.

If the selected management strategy is not adequately covered by an existing NEPA decision, it is then appropriately documented. Many APHIS ADC actions fall under the Agency's categorical exclusions (CE) section of the implementing regulations (7 CFR 372.14 and 40 CFR 1508.04). CEs do not exclude analysis but do exclude the need for further documentation. APHIS has requested CEs for many activities that have been found not to cause significant environmental impacts (e.g., technical assistance to recommend husbandry techniques). If the action will definitely have significant environmental effects (40 CFR 1508.27), an EIS and ROD are produced. If the significance of the effects of any proposed action is in doubt, an environmental assessment (EA) is prepared. An EA will lead either to a finding of no significant impact (FONSI) or to the preparation of an EIS and ROD. These environmental documents are appropriately shared with affected and interested parties and then the selected strategy is implemented.

(d) Implementation

The project is carried out in agreement with APHIS ADC's standard operating procedures and any mitigations necessary to protect against adverse environmental impacts. If further APHIS ADC work is required after monitoring and evaluation of the actions taken, the action continues or a new strategy is initiated and the decision and NEPA processes continue until the damage problem is managed.

(e) Monitoring

From a NEPA standpoint, monitoring is used to demonstrate and measure the effectiveness of the mitigations to any action, the effects of actions on the environment, and program compliance with laws, regulations, policies, direction, and decisions.

In general, there are three types of monitoring associated with any action or group of actions: (1) monitoring the implementation of a selected action or group of actions to measure the effectiveness of the selected strategy; (2) after this, general long-term monitoring on a broader scale, using results of input from the specialists or the other affected and interested parties (e.g., Do the same or similar problems recur within an unreasonably short time-frame?); (3) monitoring of the overall environmental effects of the APHIS ADC program in accordance with the monitoring plan section of Chapter 5.

c. Denver Wildlife Research Center

Scientific information, control methods development, and other APHIS ADC program research and development needs are served primarily by the DWRC. The DWRC is funded primarily from congressional appropriations to APHIS for wildlife damage control methods development (Table 2-3).

The DWRC has been in existence since 1940 and has a worldwide reputation as a center of excellence in wildlife damage control technology. In FY 1988 the DWRC employed approximately 140 scientists, technicians, and support personnel (Figure 2-7). The professional staff consists of wildlife biologists, chemists, physiologists, a pharmacologist, statisticians, computer programmers, librarians, and other specialists. Approximately 70 percent of the work force is located in Denver, CO, and approximately 30 percent at field stations throughout the United States (Figure 2-8).

The DWRC is responsible for the development and improvement of techniques to resolve wildlife damage and nuisance problems effectively and economically with minimal risks to humans and the environment. The DWRC, along with the Pocatello Supply Depot (PSD), also serves to move newly developed and tested control tools into commercial production. New and existing control methods are evaluated for impacts on target species and the environment. Wildlife damage assessments and studies in wildlife biology, ecology, and behavior are commonly conducted as components of these evaluations. In addition, extensive data are developed and collected for EPA registrations of vertebrate pesticides and control materials.

Research personnel consult with the interested public, APHIS ADC operational personnel, and others to ensure that APHIS ADC program needs are met. Technical and scientific information is provided through these consultations and also by the DWRC reference library, which specializes in wildlife damage management.

Research use of chemical pesticides during FY 1988 is described in Appendix K. Other DWRC activities in FY 1988 were determined not to cause significant environmental impacts and are not examined further.

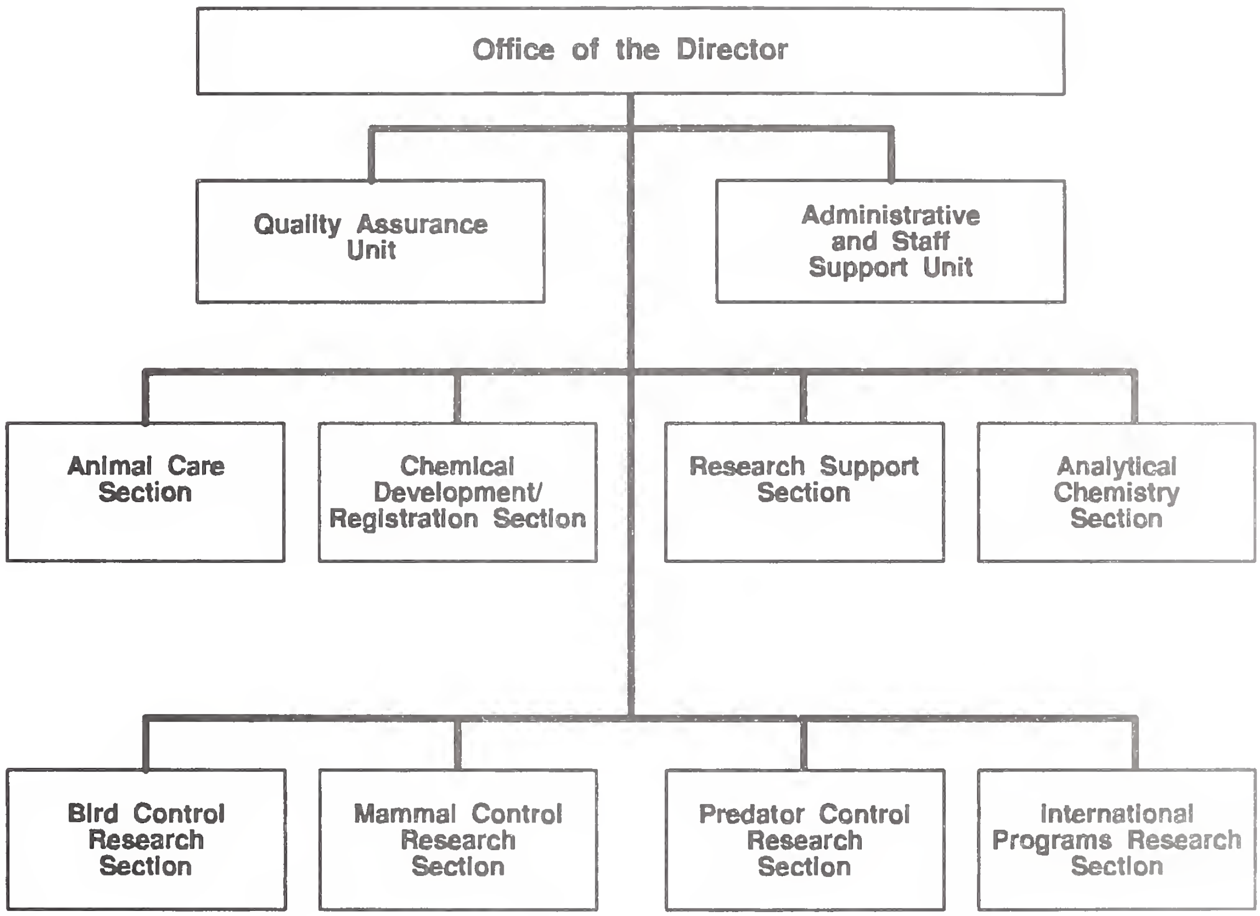
d. Pocatello Supply Depot

The Pocatello Supply Depot (PSD), Idaho, manufactures and sells specialized wildlife damage control materials not readily available from commercial sources. These are high-quality products that are needed in such low quantities or at such infrequent intervals that commercial sources have shown little interest in providing them. The PSD also assists with the improvement of existing APHIS ADC control tools. Finally, PSD serves to move new tools developed by the DWRC into manufacturing and distribution, either directly or through commercial sources.

The PSD operates as a cooperative entity through a cooperative agreement with APHIS ADC and the Pocatello Chamber of Commerce. APHIS ADC manages the operation of the PSD, and the Chamber of Commerce serves as trustee for a not-for-profit, revolving fund maintained by sale of the limited-volume products. The fund provides for all product inventories and a civilian work force for manufacturing the products. The Federal Government funds two management positions and provides and maintains the building.

The PSD manufactures, labels, ships, and sells all products in conformance with applicable EPA, USDOT, Occupational Safety and Health Administration, U.S. Postal Service, and other Federal, State, and local regulations. The activities of the PSD are analyzed as part of the APHIS ADC program.

Figure 2-7 **Organization of the Denver Wildlife Research Center, May 1992**



3. Nonlethal Control Program Alternative

The Nonlethal Control Program Alternative is a modification of the Current Program Alternative wherein no lethal technical assistance or direct control would be recommended or used by APHIS ADC. Both technical assistance and direct control would be provided in the context of a modified IPM approach that administratively constrains APHIS ADC personnel to use nonlethal strategies to resolve wildlife damage problems. The APHIS ADC decision model (Figure 2-4) would still be used in determining the best approach for resolving wildlife damage, but lethal methods would be administratively screened from consideration in formulating control strategies (Figure 2-5). Examples of nonlethal methods for controlling damage caused by various wildlife species are listed in Table 2-4 and described in Appendix J.

The Nonlethal Control Program Alternative differs from the Current Program Alternative in that only nonlethal methods would be recommended or used by APHIS ADC personnel. If wildlife damage continued despite use of nonlethal controls, APHIS ADC would be limited to continuing the same or a similar strategy or no action. Nonlethal methods are an important component of the present APHIS ADC program and are given preference when practical in conducting IPM. In some situations, nonlethal methods alone are adequate to resolve a wildlife damage problem. Chapter 4 and Appendix N has an example illustrating resolution of a problem using nonlethal methods only.

An APHIS ADC program using only nonlethal control methods would continue to function as a collection of cooperative programs with other Federal, State, and local agencies and private entities.

The same level of Federal funding as described in the Current Program Alternative would initially be available for the Nonlethal Control Program Alternative. Staffing under the Nonlethal Control Program Alternative would be similar to that of the Current Program Alternative, but field work would decrease in some areas and staffing would likely be redistributed.

Under the Nonlethal Control Program Alternative, DWRC methods research and chemical registration would be restricted to nonlethal approaches only.

4. Nonlethal Before Lethal Control Program Alternative

The Nonlethal Before Lethal Control Program Alternative is a modification of the present APHIS ADC program. This alternative would require that APHIS ADC personnel recommend or use nonlethal methods prior to recommending or using lethal methods. Both technical assistance and direct control would be provided in the context of a modified IPM approach that administratively requires APHIS ADC to try all applicable nonlethal control methods prior to implementing lethal methods. The APHIS ADC decision model (Figure 2-4) would still be used in determining the best approach for resolving wildlife damage, but in evaluating wildlife damage control methods (compartment three of the decision model), all applicable nonlethal methods must be recommended or used first in each control strategy.

Implementation of this alternative would require APHIS ADC to identify the applicable nonlethal methods for each request for assistance, ascertain which methods have been used, and determine if others should be recommended or used prior to recommending or using lethal methods. In damage situations where acceptable resolution of wildlife conflicts is not achieved using nonlethal methods, a "good faith" decision to consider lethal controls under the IPM concept would be made by APHIS ADC specialists. When to

Figure 2-8 **Field Stations of the Denver Wildlife Research Center, May 1992**

make such a decision would depend on the nature and magnitude of damage, the ability of the resource to sustain further damage, biologic and economic considerations, and other pertinent factors.

The present APHIS ADC program recognizes nonlethal methods as an important dimension of IPM, gives them first consideration in the formulation of each control strategy, and recommends or uses them when practical before recommending or using lethal methods. However, the important distinction between the Nonlethal Before Lethal Program Alternative and the Current Program Alternative is that the former alternative would require that all practical nonlethal methods be recommended or used before any lethal methods are recommended or used. Before incorporating lethal methods into the control strategy, at least one nonlethal method must be **used** in the case of direct control, or **recommended** in the case of technical assistance. Practical nonlethal methods include those which are available and have the potential to successfully prevent or reduce wildlife damage within reasonable economic limits for specific target species and resource combinations (see Table 2-4).

Research on both nonlethal and lethal methods including chemical registration work, would be undertaken by the DWRC as described in the Current Program Alternative. Other issues pertinent to the Nonlethal Before Lethal Control Program Alternative would be similar to those described in the Current Program Alternative.

5. Damage Compensation Program Alternative

The Damage Compensation Program Alternative would replace the present APHIS ADC program activities with verification and compensation for agricultural losses due to damage by vertebrate wildlife. The legal and regulatory authority to implement such a program with federally appropriated funds does not exist at this time and would require legislation. Wildlife damage occurs to many natural and man made resources, and the present program can provide assistance for almost any type of damage when requested. However, for clarity in considering the Damage Compensation Program Alternative, only damage to agricultural crops and livestock is considered eligible for compensation for the purposes of this EIS. Wildlife damage to buildings and other structures, recreation areas, landscapes, and ornamental plantings, and wildlife damage resulting in threats to public health and safety or to other wildlife (including threatened and endangered species) would not be eligible for compensation under this program. (It is assumed that other agencies or affected individuals would act to protect these resources.) Verification and compensation of wildlife damage to agricultural crops and livestock could in themselves constitute a very large undertaking. However, by keeping the Damage Compensation Program Alternative focused on damage to agricultural crops and livestock, a clearer distinction can be made between compensation for these losses and losses that are more typically covered by some type of insurance (e.g., business and homeowner insurance) for real (real estate) and personal property. To expand the Damage Compensation Program Alternative beyond crops and livestock probably would be unrealistic.

Compensation is a conceivable alternative to the present APHIS ADC program in terms of ability to be applied programwide. As identified through scoping, the primary reason for suggesting a Damage Compensation Program Alternative is to eliminate Federal participation in the lethal control of wildlife responsible for damage. The environmental consequences of this alternative are distinguished by the elimination of direct control, technical assistance, and research, with dedication of all resources to verification and compensation for damage.

Under the Damage Compensation Program Alternative the APHIS ADC program would not be involved in the conduct or supervision of direct control, technical assistance, or research activities. All APHIS ADC program resources, both financial and human, would be directed toward verification and compensation of vertebrate wildlife damage to agricultural crops and livestock.

The cost of implementing a compensation program is difficult to estimate. Two possible ways to estimate the cost of this alternative are (1) to appropriate only as much funding as is currently available to the APHIS ADC program, or (2) to appropriate funds as necessary to compensate the actual value of losses. Under the first option, all verification and compensation costs would come from the APHIS ADC funding (FY 1988) of $24,702,366 (Table 2-3). Under the second option, the cost of the program would depend on the value of verified losses reported by agricultural producers.

As discussed in Chapter 3, the annual nationwide losses attributed to vertebrate wildlife damage greatly exceed the budget for the present APHIS ADC program. For example, damage to U.S. agricultural producers may be as high as $461 million (Wywialowski, 1992). Therefore, a compensation program funded at a level equal to that of the present APHIS ADC program would be able to compensate producers for only a fraction of their actual losses. To compensate producers for their actual loss (i.e., at parity), funding that greatly exceeds that appropriated for the present APHIS ADC program would be required. Compensation at less than parity might reduce the cost of a compensation program but would not eliminate costs associated with damage claim verification. The

discussion of the Damage Compensation Program Alternative presented in Chapter 4 discusses the expected differences between compensation at parity and compensation at less than parity.

Currently, various forms of damage compensation are in effect at the State level for selected areas and selected wildlife species. A recent survey conducted by the West Virginia Department of Natural Resources (1989) indicates that 13 States provide some form of compensation for specific types of wildlife damage. In some instances, a direct payment for confirmed losses is made; in other instances, a payment is made to provide for abatement equipment for wildlife damage control. The following discussion does not consider all 13 State program examples but considers the compensation programs in four States. These descriptions are indicative of compensation concepts and provide a basis for considering the types of program impacts potentially associated with the Damage Compensation Program Alternative analyzed in this EIS.

a. Minnesota

In Minnesota, a wildlife damage compensation program is in effect for crop and livestock losses. This program is funded through the general fund as directed by the Minnesota State Legislature and is administered through the Minnesota Department of Agriculture. Under this program there are two classes of loss claims: (1) elk damage to crops, and (2) wolf or eagle damage to livestock and domestic animals. The owner of the livestock destroyed (or crippled to the extent that it must be destroyed) by an animal classified as endangered is entitled to compensation from the Commissioner of Agriculture equal to the fair market value (not to exceed $400 per animal). The owner of an agricultural crop that is damaged by elk is entitled to the target or market price, whichever is higher, for damage exceeding $100 to a maximum of $20,000 annually. Wolf and eagle damage is encompassed by the Minnesota Endangered Species Compensation Program. Domestic animals, including horses and dogs killed by wolves or eagles, are covered under this program. Requests for control of wolf damage are directed to the APHIS ADC program. The APHIS ADC program cooperates with Minnesota by conducting wolf removal activities and assisting the Department of Natural Resources in verifying wolf damage. The total compensation payment for all claims in 1988 was $28,109 (Paul, W., Personal communication, October 25, 1989). Effective in 1992, eagle damage will no longer be covered by this compensation program.

b. Ohio

In Ohio a compensation program is in effect for damage caused by coyotes and is administered by the Ohio Department of Agriculture. The program is funded from the general revenue fund and is operational throughout the State. Based on 1988 data, coyotes are believed to live in every county of the State. Under the compensation plan, notification of depredation incidents is provided to the county dog warden who performs the investigation to determine if the damage was dog or coyote in origin. If the damage was caused by a coyote, a claim is jointly filled out by the dog warden and the Ohio Department of Natural Resources local law enforcement officer and submitted to the Ohio Department of Agriculture for authorization and payment. Technical assistance or direct control may be provided by the APHIS ADC Specialist employed by the Ohio Department of Agriculture and supervised by APHIS ADC under cooperative agreement. The Ohio Agricultural Statistical Service (1987; 1988) lists compensation payments for sheep as $22,229 in 1987 and $22,863 in 1988. The amount of compensation paid for proven losses is based on the fair market value of the livestock on the day that it was killed by the coyote.

c. Wisconsin

The Wisconsin Department of Natural Resources, Wildlife Damage Control Program is funded at approximately $1 million annually by a surcharge on hunting licenses sold in the State. State statute specifically provides abatement materials and crop damage appraisals for goose, deer, and bear damages to any commercially grown crop. Damage control technical assistance is provided and equipment loaned to farmers and producers.

The Wildlife Damage Control Program provides compensation when these abatement efforts fail. The 1988 program included a $500 "deductible" loss level and a $5,000 maximum payment per landowner per year. This compensation program currently covers only white-tailed deer, Canada geese, and black bears; all losses attributable to other species are unreported. The State program was active in 52 counties in Wisconsin and paid a total of $622,175 for deer damage to crops in 1988. The total assessed value of deer damage was $1,016,512. The total appraised damage would have been higher if it had not been for the deductible and the payment ceiling. The compensation for crop losses to deer was approximately 61 percent of the actual value of the loss.

In Wisconsin the perceived damage level from deer alone is estimated at $37 million annually (Wisconsin Agricultural Reporting Service 1984). Consequently, less than 0.5 percent of all deer damage is reported and accepted for compensation. The current Wisconsin program, developed under the 1983 Wildlife Damage Law, was first implemented in 1984. As a result, the program participation may have been low due to the newness of the program. Once the program is more widely known and understood, the deer, goose, and bear damage claims will possibly rise.

In addition to the compensation for deer, goose, and bear damage, compensation for damages caused by threatened and endangered species is provided by a fund that is earmarked at 3 percent of the $1 million. In Wisconsin the threatened and endangered species responsible for the greatest amount of damage are the federally protected gray wolf and bald eagle. The compensation for loss resulting from threatened and endangered species depredation is set at 100 percent of the assessed loss (a distinction from the deductible aspect for other species covered by the compensation program).

A cooperative wildlife damage control program implemented in 1987 is conducted between the Wisconsin Department of Natural Resources and APHIS ADC in which abatement, appraisal, and administrative activities are jointly conducted and cost shared.

d. Wyoming

In Wyoming the State Game and Fish Department provides funding for the prevention of damage caused by game animals (e.g., elk, deer, antelope, moose, bighorn sheep, bear, mountain lion, pheasant, waterfowl, and sage grouse) and for compensation to the landowner for any damage caused by big game, trophy game (black bear, grizzly bear, and mountain lion), or game birds. The APHIS ADC program assists in verifying whether predator damage was caused by a trophy game animal for which compensation may be paid. If it is determined that one of these trophy game animals must be taken, APHIS ADC may provide direct control.

The Wyoming compensation program is funded totally from license sales and receives no monies from the legislature. Wildlife depredation costs to the Wyoming Game and Fish Department are high, approximately $2 million annually, or roughly 10 percent of the annual budget. These monies cover prevention and investigation costs in addition to damage claim payments. Some of the most common forms of wildlife depredation addressed by the department include haystack and standing crop damage caused by big game animals and livestock losses caused by trophy game animals. Once the damage has been stopped or controlled, the depredation is evaluated to obtain a monetary figure for reimbursement to the landowner. The Wyoming State Game and Fish Department

compensation program has not imposed a ceiling on the amount that may be paid on any individual claim. However, the State budget for damage claim compensation has a $500,000 ceiling.

E. Comparison of Alternatives

Table 2-5 summarizes the main features of the alternatives considered in this EIS. The impacts of the No Action Alternative, Current Program Alternative, Nonlethal Control Program Alternative, Nonlethal Before Lethal Control Program Alternative, and Damage Compensation Program Alternative are evaluated and compared in Chapter 4. As indicated in Table 2-2, potential impacts of the other alternatives are covered by the, No Action Alternative, Current Program Alternative, and Damage Compensation Program Alternative.

F. Identification of the USDA APHIS Preferred Alternative

The CEQ regulations for the implementation of NEPA require agencies to identify the preferred alternative, if one exists, in the Draft Environmental Impact Statement (DEIS). In keeping with that requirement, the DEIS identified the Current Program Alternative as the preferred alternative. After further consideration of comments on the DEIS, the Supplement to the Draft Environmental Impact Statement, and re-evaluation of the 13 programmatic alternatives described in this EIS, APHIS again identified the Current Program Alternative as the preferred alternative to meet its responsibilities under the Animal Damage Control Act of 1931 and other applicable laws.

Table 2-5

Comparison of Alternatives Presented in Detail and Alternatives Not Presented in Detail in This EIS

Alternative	Technical Assistance	Direct Control	Research Provided	Estimated Costs	Staffing
No Action	APHIS ADC would not provide technical assistance for wildlife damage control. Other Federal, State, or local agencies or individuals might accept a new or greater role in technical assistance.	APHIS ADC would not provide lethal or nonlethal direct control to prevent or reduce wildlife damage. Other Federal, State, or local agencies, or individuals, might accept a new or greater role in direct control.	APHIS ADC would not provide research support for wildlife damage control. Consequently, some currently available control methods may be lost. However, other Federal, State, or local agencies might accept a new or greater role in research.	APHIS ADC would not expend funds for wildlife damage control. Other Federal, State, or local agencies, or individuals, might accept new or greater responsibilities for wildlife damage control. Potential expenditures are unknown.	APHIS ADC would have no APHIS ADC staff. Wildlife damage control staffing of other Federal, State, or local agencies or individuals is unknown.
Current Program	The APHIS ADC program would provide technical assistance as part of the IPM approach to prevent or reduce wildlife damage.	The APHIS ADC program would provide both lethal and nonlethal direct control (IPM approach) to prevent or reduce wildlife damage.	The present APHIS ADC program's research and development needs are served primarily by the DWRC. Research is focused on developing and improving wildlife damage control techniques, and on minimizing the impact on humans, wildlife, and the environment.	APHIS ADC appropriations for the present program were approximately $25 million in FY 1988. Cooperative funds totaled approximately $13 million.	The present APHIS ADC program is staffed by approximately 900 Federal, State, and cooperative employees.
Nonlethal Control Program	APHIS ADC would provide technical assistance as part of a modified IPM approach limited to the use of nonlethal methods to prevent or reduce wildlife damage.	APHIS ADC would apply only nonlethal direct control as part of a modified IPM approach limited to the use of nonlethal methods to prevent or reduce wildlife damage.	All APHIS ADC research and development would be restricted to nonlethal control techniques and strategies.	The level of Federal funding would initially remain the same as the present APHIS ADC program.	Staffing would be similar to the present APHIS ADC program.
Nonlethal Before Lethal Control Program	APHIS ADC would provide technical assistance recommendations based on a modified IPM approach that requires that all practical nonlethal methods be tried before recommending any lethal control measures.	APHIS ADC would use a modified IPM approach, applying all practical nonlethal control methods prior to implementing lethal control methods.	The structure of the DWRC research program would remain largely the same as under the present APHIS ADC program but with an increased emphasis on development of nonlethal control methods and strategies.	Program costs would increase in order to minimize the loss of program effectiveness. Cooperative funding may decrease.	APHIS ADC program staffing needs would exceed present program levels.

(Continued)

Table 2-5 (Continued)

Comparison of Alternatives Presented in Detail and Alternatives Not Presented in Detail in This EIS

Alternative	Technical Assistance	Direct Control	Research Provided	Estimated Costs	Staffing
Damage Compensation Program	APHIS ADC would not provide technical assistance to prevent or reduce wildlife damage. Depending on the level of compensation provided, other Federal, State, or local agencies or individuals might provide technical assistance.	APHIS ADC would not provide lethal or nonlethal direct control to prevent or reduce wildlife damage. Depending on the level of compensation provided, other Federal, State, or local agencies or individuals might provide direct control.	APHIS ADC would not conduct research. Depending on the level of compensation provided, other Federal, State, or local agencies or individuals might conduct research to improve wildlife damage control techniques.	Financial costs would depend on the level of compensation provided. If limited to the present level of funding, this amount would not allow compensation at full value. Compensation at full value would require expenditures greatly exceeding those of the present program.	All APHIS ADC staff would be involved in verification of and compensation for wildlife damage to agricultural crops and livestock. Program staffing could exceed present program levels.
Direct Control with Supporting Research	No technical assistance would be provided.	APHIS ADC would provide both lethal and nonlethal direct control (IPM approach) to prevent or reduce wildlife damage.	APHIS ADC would conduct research similar to the present program.	The level of funding would be approximately the same as that for the present program, but funds would be expended only on direct control and research.	Staffing would be similar to that of the present program.
Technical Assistance Only With Supporting Research	APHIS ADC would provide technical assistance as part of the IPM approach to prevent or reduce wildlife damage.	APHIS ADC would not provide direct control.	APHIS ADC would conduct research similar to the present program.	The level of funding would be approximately the same as that for the present program, but funds would be expended only on technical assistance and research.	Staffing would be similar to that of the present program.
Conversion of Direct control to Education and Technical Assistance, with Transfer of All Funds and Responsibilities to the USDA Extension Service (ES)	Technical assistance or education would be conducted by the ES as the sole program focus.	The ES would not conduct direct control.	The ES would not conduct supporting research.	The level of funding would be similar to that of the present program.	Staffing would consist of ES personnel.

(Continued)

Table 2-5 (Continued)

Comparison of Alternatives Presented in Detail and Alternatives Not Presented in Detail in This EIS

Alternative	Technical Assistance	Direct Control	Research Provided	Estimated Costs	Staffing
Reduction of Federal Manpower and Transfer of Federal Control Operations to Private Contractors	Technical assistance would be conducted by private contractors under APHIS ADC contract oversight.	Direct control would be conducted by private contractors under APHIS ADC contract oversight.	Research would be conducted by private contractors under APHIS ADC contract oversight.	The level of funding would be similar to that of the present program.	APHIS ADC employees would act as contract supervisors.
Transfer of Present Program, Including Funds, to State Wildlife Agencies	Each State wildlife agency would conduct technical assistance activities.	Each State wildlife agency would conduct direct control activities.	Each State wildlife agency would be responsible for conducting research by itself or on a cooperative basis with other States.	The level of funding would be similar to that of the present program.	No APHIS employees would be involved in animal damage control activities.

Chapter 3

Affected Environment

Readers Guide

Chapter 3: Affected Environment

Discusses those aspects of the human environment that are potentially affected by the alternatives described in Chapter 2, including:

- Protected resources, such as crops, livestock, facilities and structures, and public health and safety.
- Target and nontarget wildlife and threatened and endangered species.
- Economic environment.
- Sociocultural environment.
- Physical environment.

Chapter 3

Affected Environment

Table of Contents

A. Introduction

Chapter 3 focuses on those aspects of the biological, economic, sociocultural, and physical environments that are likely to be affected by the current Animal and Plant Health Inspection Service (APHIS) Animal Damage Control (ADC) program or the alternatives. This final Environmental Impact Statement (EIS) encompasses important and controversial issues identified by the public during scoping and in comments on the draft EIS, including those aspects of the environment that are likely to be significantly impacted by APHIS ADC program activities.

The resources protected are those for which APHIS ADC was requested to provide technical assistance or direct control for damage problems during fiscal year (FY) 1988. They are described in terms of resource category, type of damage, and species causing damage. The biological environment is described in terms of the wildlife species affected. The economic environment is described in terms of the value of production related to the major crops and livestock protected by the APHIS ADC program, and the value of losses attributable to wildlife damage to these resources. The sociocultural environment is described in terms of the major groups within American society that hold values or attitudes potentially impacted by APHIS ADC program activities. The physical environment includes air, water, soil, and human health.

The resources protected by the APHIS ADC program range from agricultural crops and livestock to urban property and airports. Only a portion of each total resource is protected by the APHIS ADC program. Control activities are highly variable among States and are dependent on damage control needs, authority provided to the APHIS ADC program, availability of APHIS ADC personnel, technical expertise, and cooperative or other funding sources.

B. Major Resources Protected

The APHIS ADC program provides damage control assistance for agricultural resources, manmade structures and facilities, and threats to public health and safety throughout the United States. Levels of technical assistance and direct control vary among the 50 States because of the distribution of the resources that require protection and the various requests for assistance received by the APHIS ADC program (Table 3-1). The following sections outline the major resources protected by the APHIS ADC program (i.e., those that are the focus of APHIS ADC program efforts and funding) and the species responsible for damage.

1. Field Crops

Depredation of field crops, including vegetables, is caused by a variety of mammals and birds, ranging from black bears to blackbirds (Table 3-2). Field crops can be damaged at any time during planting, growing, harvesting, or storage. Peak damage periods vary among States, depending on geographic location, planting and harvest times, and seasonal wildlife activities. Activities primarily responsible for damage to field crops include eating newly planted seeds, pulling sprouts, eating mature crops, trampling, and digging and burrowing around field crops. Along with grains and other produce grown on farms, vegetables grown in small home and truck gardens also are damaged by the species shown in the table.

A 1974 questionnaire survey of bird damage to ripening grain sorghum in the United States (Knittle and Guarino 1976) listed a variety of reasons for damage caused by birds. The reasons (in descending order of importance) were large numbers of birds; the variety of sorghum grown; agricultural practices (e.g., small fields); and locations of fields (e.g., near roosts or wooded areas). This list also may indicate the reasons for damage to other crops caused by a variety of wildlife.

Table 3-1

Crops, Livestock, and Other Resources for Which the APHIS ADC Program Was Requested to Provide Direct Control or Technical Assistance by Resource and State, FY 1988[a]

Resources	AK	AZ	AR	CA	CO	DE/ MD b,c	FL	GA	HI	ID	IL	IN	IA/ MO[b]	KS	LA	ME	MA/ CT/ RI[b]
CROPS																	
Field Crops																	
Alfalfa				•													
Barley or rye								•									
Cabbage/lettuce		•							•								
Chilies, peas		•															
Corn		•		•	•		•	•				•		•		•	
Cotton		•															
Oats or millet		•							•					•			
Pasture/haystack		•	•	•				•	•								
Peanuts							•										
Rice			•	•											•		
Sorghum/milo		•	•					•					•	•			
Soybeans			•	•			•					•			•		
Sugar cane							•										
Sunflowers			•	•										•			
Wheat			•			•		•			•		•		•		
Home gardens		•				•											•
Truck gardens/other vegetables		•		•					•						•		
Fruits and Nuts																	
Apples		•	•	•													
Blueberries							•	•								•	•
Cherries				•													
Citrus fruits							•										
Grapes				•	•	•				•							
Melons		•				•	•	•									
Peaches				•	•												
Pears																	
Strawberries							•									•	•
Other fruit					•	•		•									
Pecans		•	•											•			
Other Nuts		•		•													
Commercial Forests/Forest Products																	
Pine plantings/christmas trees																	
Timber			•	•				•							•		
Maple sap tubing																	

(Continued)

	MI	MN	MS/ AL[b]	MT	NE	NV	NH/ VT[b]	NM	NY	NC	ND	OH	OK	OR	PA/ NJ[b,d]	SC	SD	TN/ KY[b]	TX	UT	VA	WA	WV	WI	WY
								•				•	•	•					•	•	•	•		•	
								•			•			•					•			•			
								•											•						
								•											•			•			
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							•																		

(Continued)

Table 3-1 (Continued)

Crops, Livestock, and Other Resources for Which the APHIS ADC Program Was Requested to Provide Direct Control or Technical Assistance by Resource and State, FY 1988[a]

Resources	AK	AZ	AR	CA	CO	DE/MD[b,c]	FL	GA	HI	ID	IL	IN	IA/MO[b]	KS	LA	ME	MA/CT/RI[b]
Grazing Lands and Other Resources																	
Rangeland																	
Apiaries				•													
Feedlot grain		•		•	•					•		•					
Horticultural/ornamental		•		•		•	•				•	•					
Turf/flower beds		•		•		•						•					
Aquaculture																	
Bass and bluegill																	
Catfish			•										•		•		
Crawfish															•		
Minnows (bait)			•										•				
Trout								•								•	
Other fish				•	•		•			•							
Lobster/blue mussel/oyster																•	
Salmon																•	
Shrimp/prawn																	
LIVESTOCK																	
Cattle and calves		•	•	•	•	•	•	•		•					•		
Chickens		•	•	•	•		•	•		•				•	•	•	
Ducks and geese		•		•	•												
Goats and kids		•		•	•												
Horses and foals		•		•			•										
Pea and guinea fowl/pigeons		•		•	•												
Sheep and lambs		•		•	•					•		•	•	•	•		•
Swine		•	•				•			•							
Turkeys				•	•												
Exotic and other species	•			•	•												

(Continued)

	MI	MN	MS/ AL[b]	MT	NE	NV	NH/ VT[b]	NM	NY	NC	ND	OH	OK	OR	PA/ NJ[b,d]	SC	SD	TN/ KY[b]	TX	UT	VA	WA	WV	WI	WY
								•					•						•						
				•					•										•						
								•	•			•	•						•			•			
								•		•			•	•					•			•			
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						•		•	•				•	•					•			•	•		•
				•				•			•		•	•			•		•	•		•			•
		•		•				•			•		•	•											
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				•	•			•			•		•	•	•	•	•		•						
		•						•	•		•		•	•					•	•					
				•	•								•						•						

(Continued)

Table 3-1 (Continued)

Crops, Livestock, and Other Resources for Which the APHIS ADC Program Was Requested to Provide Direct Control or Technical Assistance by Resource and State, FY 1988[a]

Resources	AK	AZ	AR	CA	CO	DE/MD[b,c]	FL	GA	HI	ID	IL	IN	IA/MO[b]	KS	LA	ME	MA/CT/RI[b]
OTHER RESOURCES																	
Automobiles/equipment																	●
Buildings/barns/homes	●	●	●	●	●	●		●		●		●	●	●	●	●	●
Commerical/industrial				●		●	●						●			●	●
Dikes/ditches/irrigation		●		●				●				●					
Fences		●															
Golf courses/parks													●			●	●
Lakes/pools/reservoirs						●		●								●	
Landfills/dumps							●									●	
Nuisance[e]			●	●		●	●	●		●	●	●	●		●	●	●
Utilities						●										●	●

[a] Information obtained from FY 1988 APHIS ADC State annual reports.
[b] Data for these States are combined in APHIS ADC State annual reports.
[c] Includes data for Washington, D.C.

	MI	MN	MS/ AL[b]	MT	NE	NV	NH/ VT[b]	NM	NY	NC	ND	OH	OK	OR	PA/ NJ[b,d]	SC	SD	TN/ KY[b]	TX	UT	VA	WA	WV	WI	WY
	●							●	●										●						
		●		●	●		●	●	●	●	●		●	●		●			●		●			●	
	●	●					●		●					●									●		
								●					●	●		●			●						
													●	●							●				
					●	●																			
																		●							
	●	●	●				●		●	●	●	●	●	●	●	●		●	●		●	●	●	●	
		●							●			●													

[d] Includes data for NewYork City.
[e] Nuisance is not a resource but is included to show the distribution of States where nuisance problems were reported.

Table 3-2

Mammal and Bird Damage to Field Crops as Reported to APHIS ADC in FY 1988[a]

Mammals and Birds	Alfalfa	Barley or Rye	Corn	Cotton	Oats or Millet	Pasture/Haystacks	Peanuts	Rice	Sorghum/Milo	Soybeans	Sugar Cane	Sunflowers	Wheat	Chillies, Peas, or Pumpkins	Cabbage/Lettuce	Home Gardens	Truck Gardens	Activities Responsible for Damage
Armadillo																●		eating; digging
Badger	●					●										●		eating; digging
Bear, black			●				●											eating; digging; trampling; bedding
Beaver	●			●		●	●			●		●	●				●	eating; trampling; flooding
Boar, Russian	●																	eating; digging
Cat, domestic																●		eating; digging
Coyote														●		●		eating; digging
Deer species	●		●				●			●			●	●		●	●	eating; trampling; bedding
Gopher species	●	●			●	●	●		●							●	●	eating; digging; burrowing
Hog, feral	●		●			●	●	●	●								●	eating; digging; trampling; bedding
Jackrabbit species	●			●											●	●	●	eating
Marmot species						●												eating; trampling; bedding; burrowing
Mole species																●		eating; digging
Muskrat						●		●										eating; nesting; burrowing
Nutria						●	●	●					●					eating; nesting; burrowing
Opossum			●													●		eating; digging
Peccary (javelina)			●											●	●	●		eating; digging; trampling; bedding
Porcupine			●													●		eating
Prairie dog species	●	●	●		●	●			●			●	●			●	●	eating; nesting; burrowing; digging
Pronghorn (antelope)	●																	eating; trampling; bedding
Rabbit, cottontail															●	●		eating
Raccoon			●							●						●	●	eating; digging
Rat, black																●		eating; digging
Rat, kangaroo						●												eating
Rat, Norway						●										●		eating; digging

(Continued)

Table 3-2 (Continued)

Mammal and Bird Damage to Field Crops as Reported to APHIS ADC in FY 1988[a]

Mammals and Birds	Alfalfa	Barley or Rye	Corn	Cotton	Oats or Millet	Pasture/Haystacks	Peanuts	Rice	Sorghum/Milo	Soybeans	Sugar Cane	Sunflowers	Wheat	Chillies, Peas, or Pumpkins	Cabbage/Lettuce	Home Gardens	Truck Gardens	Activities Responsible for Damage
Rodent, commensal species											•					•		eating
Skunk species			•						•							•	•	eating
Squirrel species		•												•		•		eating
Squirrel, Eastern fox						•										•		eating
Squirrel, ground species						•								•		•		eating; digging; burrowing
Woodchuck						•				•						•		eating; digging; trampling; bedding; burrowing
Blackbird group			•		•			•	•	•		•	•			•	•	eating
Crane, sandhill	•		•		•	•							•					eating; trampling
Crow species		•	•				•						•					eating
Goose, Canada	•	•	•			•				•			•			•		eating; trampling
Goose/duck species	•	•	•		•	•		•	•				•	•		•		eating; trampling
Gull species											•							eating; digging
Lark, bunting									•									eating
Lark, horned															•			eating
Mannikin, nutmeg (ricebird)					•													eating
Pheasant			•															eating
Pigeon (rock dove)						•												eating
Raven species		•	•		•													eating
Sparrow species									•						•	•		eating
Swan													•					eating
Other Birds		•											•	•		•		eating

[a] Information obtained from FY 1988 APHIS ADC State annual reports.

2. Fruits and Nuts

Mammals, such as black bears, deer, raccoons, and squirrels, eat fruits and nuts and damage tree branches. Birds also are responsible for losses to this segment of agriculture (Table 3-3). Birds eat buds and ripening fruit and may cause damage when large numbers roost in trees. If a tree is severely browsed or damage occurs to the buds, tree vigor and fruit yield will be lowered. Also, trees are more susceptible to disease and insect infestation if they have been girdled or the bark has been stripped. Deer may damage fruit and other trees by rubbing their antlers on the trunk and branches. Some species, such as gophers, nutria, ground squirrels, voles, and other rodents, damage the root systems of trees by foraging and burrowing activities.

3. Commercial Forests/Forest Products

Damage to commercial forests and forest products is an extensive problem throughout the United States (California Forest Pest Council 1988). Because of a similarity in type of damage and species involved, horticultural and ornamental plantings are included in this resource category. Wildlife responsible for damage include deer, beaver, black bear, gopher, porcupine, squirrel, other rodents, and a variety of birds (Table 3-4). These species temporarily or permanently damage plants and trees by eating seedlings, bark, branches, and roots.

In an effort to access food sources, black bears may break branches or fell whole, small trees and may damage forest resources by peeling the bark either to eat the inner layers or sharpen their claws. Deer may cause damage in the fall by rubbing their antlers on tree trunks and branches. Beavers may cause damage by directly cutting down timber or by flooding large acreages of timberlands.

Some birds roost in such dense flocks that their droppings may kill or damage trees. Woodpeckers may damage trees by pecking holes. Various rodents may cause damage by chewing or gnawing on plastic tubing used in drip irrigation systems or maple syrup operations to collect sap from maple trees.

4. Grazing Lands and Other Resources

Badgers, feral hogs, beavers, gophers, prairie dogs, jackrabbits, and kangaroo rats compete with livestock for forage or damage rangelands. Competition may be more severe during drought years when forage production is reduced. Burrowing, digging, and dam building (flooding) activities also damage rangelands. Other species, particularly raccoons, skunks, and seed-eating birds, eat feedlot grain or contaminate it with fecal matter. This results not only in loss of grain but also in concern for public health. Black bears, raccoons, and striped skunks eat bees and honey and sometimes severely damage or destroy apiaries. Turf and flower beds are damaged by many mammals and birds, including badgers, deer, foxes, peccaries, opossums, raccoons, skunks, beavers, other large and small rodents, geese, ducks, blackbirds, and starlings. The species affecting grazing lands and other resources are listed in Table 3-5.

Table 3-3

Mammal and Bird Damage to Fruits and Nuts as Reported to APHIS ADC in FY 1988[a]

Mammals and Birds	Apples	Blueberries	Cherries	Citrus Fruits	Grapes	Peaches	Pears	Strawberries	Other Fruits	Watermelons	Other Melons	Pecans	Other Nuts	Activities Responsible for Damage
Armadillo													•	burrowing
Bear, black	•					•			•					eating; breaking branches; clawing trees
Beaver	•				•				•			•		eating; felling trees; flooding from dam building
Coyote										•	•			eating
Deer species	•			•	•	•			•	•	•	•		eating; rubbing antlers on trees; breaking branches
Fox, gray			•		•									eating
Gopher species	•				•				•	•		•		burrowing; eating
Jackrabbit species	•											•		eating
Mouse, house												•		eating
Nutria												•		eating; burrowing
Opossum			•		•				•					eating
Peccary (javelina)										•				eating
Porcupine	•								•					eating; breaking branches
Prairie dog species												•		eating; burrowing
Rabbit, cottontail	•													eating
Raccoon	•		•		•				•	•				eating
Rat, black												•		eating
Rat, cotton												•		eating
Rat, Norway												•		eating
Skunk, striped					•									eating
Squirrel, Eastern fox	•								•	•		•	•	eating
Squirrel, gray												•		eating
Squirrel, ground species								•				•		eating; burrowing
Vole species	•													eating; burrowing
Blackbird group	•		•		•			•	•		•			eating
Cedar waxwing		•						•						eating
Crow species	•	•							•	•		•		eating; breaking branches
Goose species		•									•			eating
Gull species		•												eating
Lark, bunting											•			eating

(Continued)

Table 3-3 (Continued)

Mammal and Bird Damage to Fruits and Nuts as Reported to APHIS ADC in FY 1988[a]

Mammals and Birds	Apples	Blueberries	Cherries	Citrus Fruits	Grapes	Peaches	Pears	Strawberries	Other Fruits	Watermelons	Other Melons	Pecans	Other Nuts	Activities Responsible for Damage
Magpie, black-billed	●		●			●	●		●			●		eating
Mockingbird									●					eating
Pheasant											●			eating
Quail species											●			eating
Raven species			●							●		●	●	eating
Robin, American			●		●			●			●			eating; breaking branches
Sparrow/finch species		●	●		●	●								eating
Starling, European	●	●	●		●	●	●		●					eating; breaking branches
Woodpecker species												●		pecking
Other birds	●	●			●	●			●					eating

[a] Information obtained from FY 1988 APHIS ADC State annual reports.

Table 3-4

Mammal and Bird Damage to Commercial Forests/Forest Products as Reported to APHIS ADC in FY 1988[a]

Mammals and Birds	Horticultural/ Ornamental Plantings	Christmas Trees and Conifer Plantations	Timber	Activities Responsible for Damage
Armadillo	•			eating; burrowing
Bear, black			•	eating; breaking branches; clawing trunk
Beaver	•		•	eating; felling trees; flooding from dam building
Deer species	•		•	eating; breaking branches; rubbing antlers on trunk
Gopher species	•	•	•	eating; burrowing
Hog, feral	•			eating; breaking branches
Nutria	•			eating; burrowing
Opossum	•			eating
Peccary (javelina)	•			eating; breaking branches
Porcupine	•	•	•	eating
Rabbit, cottontail	•			eating
Rabbit species			•	eating
Raccoon	•			eating
Rat species	•			eating
Rodent species[b]	•	•	•	gnawing; eating
Squirrel, Eastern fox	•		•	eating
Squirrel, ground species	•		•	eating
Vole species	•		•	eating; burrowing
Blackbird group	•	•		eating; breaking branches
Crane, sandhill		•		eating
Duck species		•		eating
Goose species	•	•		eating
Grosbeak		•		eating; breaking branches
Pigeon (rock dove)	•			eating; breaking branches
Robin, American	•			eating
Sparrow species	•			eating
Starling	•	•		eating; breaking branches
Woodpecker species	•			pecking
Other birds		•		eating; breaking branches

[a] Information obtained from FY 1988 APHIS ADC State annual reports.
[b] Gnawing on maple sap collection tubing also results in loss of sap.

Table 3-5

Mammal and Bird Damage to Grazing Lands and Other Resources as Reported to APHIS ADC in FY 1988[a]

Mammals and Birds	Pasture and Rangeland	Feedlot Grain	Apiaries	Turf/ Flower Beds	Activities Responsible for Damage
Armadillo				•	eating; burrowing
Badger	•			•	burrowing
Bear, black			•		eating
Beaver	•			•	eating; trampling; flooding from dam building
Cat, domestic				•	digging
Deer species				•	eating
Fox, gray				•	digging; burrowing
Gopher species	•			•	eating; burrowing
Hog, feral	•				eating; digging
Jackrabbit species	•			•	eating
Marmot species				•	eating
Mole species				•	burrowing
Mouse, house				•	eating
Nutria				•	eating; burrowing
Opossum				•	eating
Peccary (javelina)				•	eating
Prairie dog species	•			•	eating; burrowing
Rabbit, cottontail				•	eating; burrowing
Raccoon		•	•	•	eating
Rat, black				•	eating
Rat, cotton				•	eating; burrowing
Rat, kangaroo	•				eating
Rat, Norway				•	eating
Rodent (commensal species)		•		•	eating; contaminating with excrement
Skunk, striped		•	•	•	eating
Skunk species				•	eating
Squirrel, Eastern fox				•	eating
Squirrel, gray				•	eating
Squirrel, ground species				•	eating
Vole species				•	eating
Blackbird group		•		•	eating; contaminating with excrement
Crow species		•			eating

(Continued)

Table 3-5 (Continued)

Mammal and Bird Damage to Grazing Lands and Other Resources as Reported to APHIS ADC in FY 1988[a]

Mammals and Birds	Pasture and Rangeland	Feedlot Grain	Apiaries	Turf/ Flower Beds	Activities Responsible for Damage
Duck/coot species	•			•	eating
Goose species	•			•	eating
Gull species		•			eating; contaminating with excrement
Pigeon (rock dove)		•			eating; contaminating with excrement
Raven species		•			eating
Starling		•		•	eating; contaminating with excrement
Swan				•	eating

[a] Information obtained from FY 1988 APHIS ADC State annual reports.

Mississippi catfish are produced in large ponds where protection from birds is difficult.

5. Aquaculture and Mariculture

Freshwater aquaculture is an important and growing industry in the United States, particularly in the Southeast. Associated with this growth, there has been a dramatic increase in the acreage of shallow water areas, which are ideal habitat for fish-eating birds. For example, commercial catfish production in Mississippi has increased since its inception in 1965 to over 88,000 acres in 1988 (Stickley and Andrews 1989). Catfish, trout, bait fish (minnows), and other fish are raised in ponds, which provide attractive feeding areas for fish-eating birds. Depredation incidents reported to the APHIS ADC program were for a variety of cultivated freshwater and marine species, including bass, bluegill, catfish, crayfish, bait minnows, trout, lobster, mussels, salmon, and shrimp (Table 3-6). Bird depredation is responsible for the greatest wildlife-caused losses of aquacultural and maricultural resources. Depredating birds include cormorants, ducks, egrets, gulls, herons, osprey, and pelicans. Minks, otters, raccoons, and beavers also are responsible for damage to aquacultural and maricultural resources by feeding or burrowing activities.

6. Livestock

Livestock is one of the major resource groups affected by wildlife damage. Sheep and lambs, goats and kids, cattle and calves, and poultry and swine are the predominant resources within this group. A variety of mammals and birds kill, eat, injure, or harass livestock; spread disease; or compete for food resources (Table 3-7). Direct losses occur when livestock predators, such as coyotes, bobcats, mountain lions, domestic dogs, grizzly and black bears, foxes, wolves, and eagles, as well as other raptors, kill and eat livestock. As a subgroup, sheep and lambs suffer the largest number of direct losses to predators. For several types of livestock, losses occur on a seasonal basis, with the highest losses occurring at the time of lambing or calving. In addition, during certain periods of the year (particularly in the Western States), livestock graze remote ranges in high pasture areas where they are isolated and vulnerable to predation.

Another environmental factor that may increase wildlife damage problems is drought conditions within the grazing area. Drought years may aggravate some predation problems by reducing natural wildlife prey species populations, resulting in increased predator pressures on livestock herds.

Losses also may occur when livestock eat grain contaminated by bird or rodent defecation, resulting in sickness or death; when livestock must compete with wild mammals and birds for grain or food; or when harassment of livestock by predators reduces production.

7. Facilities and Structures

Property damage caused by wildlife is an extensive problem throughout the United States (Hawthorne 1983). Damage occurs to all types of property, including private homes, barns, commercial and industrial buildings, public property, lakes, pools, reservoirs, and golf courses (Table 3-8). Other structures, such as telephone poles, fences, landfills and dumps, dikes and impoundments, irrigation ditches, and landscapes, also sustain wildlife damage.

Depending on the species, damage may range from minor nuisances to severe structural damage. Many species damage buildings and the surrounding landscape by nesting, burrowing, and digging activities. Species such as the bobcat, coyote, fox, raccoon, and domestic dog may get into garbage cans or kill small pets. Opossums, tree squirrels, and commensal rodents may chew on insulation, wiring, upholstery, and other textile products. They also may chew holes to enter a structure. Beaver damage to structures results from damming activities, which cause flooding.

Mice, rats, bats, armadillos, and squirrels may be a nuisance to the occupants of structures because of noise or the accumulation of urine and feces. Squirrels may store green conifer cones in ceilings, which then leak pitch into the interior of a house. Packrats may move large quantities of sticks and refuse into a structure where they are nesting.

Birds may cause damage to facilities and structures in various ways. Woodpeckers may chisel holes in buildings or other structures. They also may "drum" against siding and gutters as a signal or mating call. A common and noticeable problem caused by birds is the "whitewash," or droppings, they produce. This is not only an aesthetic problem, but is a health and safety issue as well.

8. Public Health and Safety

One important area of responsibility for the APHIS ADC program is the protection of public health and safety. The program responds to health and safety requests in the areas of airport safety and control of wildlife-borne diseases that are transmissible to humans or livestock.

a. Airport Protection

APHIS ADC activities are conducted with cooperators at private, commercial, and military airports throughout the country. APHIS ADC program efforts are aimed at preventing bird or mammal strikes and other damage to aircraft and airport facilities. Bird aircraft strikes at or near airport facilities during takeoff or landing are a serious airport safety problem. Mammal aircraft strikes are a concern during taxiing, landing, and takeoff. Aircraft collisions with birds or mammals can threaten human lives and result in aircraft damage.

Table 3-6

Mammal and Bird Damage to Aquacultural and Maricultural Resources as Reported to APHIS ADC in FY 1988[a]

Mammals and Birds	Bass	Bluegill	Catfish	Crayfish[b]	Minnows[b]	Other Fish	Trout	Lobsters	Blue Mussel Beds	Salmon	Shrimp/Prawns	Activities Responsible for Damage
Beaver						•						burrowing; flooding from dam building
Mink						•						eating
Otter, river				•								eating
Raccoon				•		•						eating
Sea lion										•		ripping fish nets
Cormorant, double-crested			•	•		•				•		eating
Crow species								•				eating
Duck, eider									•			eating
Egret, great and snowy			•		•		•					eating
Grebe species			•									eating
Gull species			•					•				eating
Hawk species						•						eating
Heron, great-blue			•		•		•					eating
Heron species					•		•					eating
Kingfisher					•							eating
Osprey	•	•			•	•						eating
Pelican species						•						eating
Other wading birds			•	•	•							eating
Other Birds							•			•	•	eating

[a] Information obtained from FY 1988 APHIS ADC State annual reports.
[b] Bullfrog and turtle damage to crayfish and minnows also was reported.

Table 3-7

Mammal and Bird Damage to Livestock as Reported to APHIS ADC in FY 1988[a]

Mammals and Birds	Sheep	Lambs	Goats & Kids	Cattle	Calves	Horses & Foals	Chickens	Turkeys[b]	Poultry[b]	Ducks[c]	Pea & Guinea Fowl	Geese & Pigeons	Swine	Reindeer	Activities Responsible For Damage
Badger		●					●		●						killing; injuring; harassing
Bear, black	●	●	●	●	●	●	●					●			killing; injuring; harassing
Bear, grizzly	●	●		●	●										killing; injuring; harassing
Boar, Russian			●		●										killing; injuring
Bobcat	●	●	●		●		●	●	●	●	●	●			killing; injuring; harassing
Cat, domestic							●						●		killing; injuring; harassing
Coyote	●	●	●	●	●	●	●	●	●	●	●	●	●	●	killing; injuring; harassing
Dog, domestic	●	●	●	●	●	●	●	●	●	●			●		killing; injuring; harassing
Fox species	●				●			●		●			●		killing; injuring; harassing
Fox, gray		●	●				●	●	●	●	●	●			killing; injuring; harassing
Fox, kit		●													killing; injuring
Fox, red		●	●				●	●	●		●		●		killing; injuring; harassing
Fox, swift										●					killing; injuring
Hog, feral	●		●												killing; injuring
Mountain lion	●	●	●	●	●	●	●	●					●		killing; injuring
Mink							●		●	●					killing; injuring
Opossum			●				●	●	●	●	●	●			eating
Raccoon		●	●				●	●	●	●	●	●	●		killing; injuring; harassing; transmitting disease
Ringtail							●			●					killing; injuring
Skunk, striped			●				●	●	●	●	●	●	●		killing; injuring; harassing; transmitting disease
Weasel species									●		●				killing; injuring; harassing
Wolf, gray				●		●		●						●	killing; injuring; harassing
Porcupine				●											injuring
Rat, Norway							●								killing; injuring; harassing; transmitting disease
Crow species					●										killing; injuring
Eagle species	●				●		●	●	●	●					killing; injuring
Eagle, bald		●							●				●		killing; injuring
Eagle, golden		●	●		●										killing; injuring
Gull species										●					transmitting disease
Hawk/Falcon species							●		●			●			killing; injuring; harassing
Hawk, red-tailed							●			●					killing; injuring
Owl species		●				●	●								killing; injuring; harassing

(Continued)

Table 3-7

Mammal and Bird Damage to Livestock as Reported to APHIS ADC in FY 1988[a]

Mammals and Birds	Sheep	Lambs	Goats & Kids	Cattle	Calves	Horses & Foals	Chickens	Turkeys[b]	Poultry[b]	Ducks[c]	Pea & Guinea Fowl	Geese & Pigeons	Swine	Reindeer	Activities Responsible For Damage
Owl, great horned							•								killing; injuring
Owl, snowy							•								killing; injuring
Pigeon (rock dove)				•											transmitting disease
Raven species	•	•	•	•	•		•							•	killing; injuring
Sparrow species							•								transmitting disease
Starling				•	•	•									transmitting disease
Vulture species	•	•	•		•	•									killing; injuring
Vulture, black	•	•		•	•								•		killing; injuring; harassing

[a] Information obtained from FY 1988 APHIS ADC State annual reports.
[b] Several APHIS ADC State annual reports indicate "poultry" but do not indicate whether chickens, turkeys, or other types of poultry were damaged.
[c] Turtle damage to ducks also was reported.

Table 3-8

Mammal and Bird Damage to Facilities and Structures as Reported to APHIS ADC in FY 1988[a]

	Buildings				*Recreation Areas*			*Other Structures*							
Mammals and Birds	Barns	Buildings	Commercial/Industrial	Private Homes	Golf Courses	Public Property	Lakes/Pools/Reservoirs	Automobile Equipment	Dikes/Ditches/Irrigation	Fences	Landfills/Dumps	Telephonr Poles	Utilities	Nuisance[b]	**Activities Responsible for Damage**
Mammals															
Armadillo		•												•	burrowing; digging; scratching
Badger					•	•			•					•	burrowing; digging
Bat species		•												•	noise; defecation
Bear, black		•				•				•				•	ripping and clawing
Bear, grizzly	•														ripping and clawing
Beaver		•				•			•						burrowing; digging; flooding from dam building
Bobcat		•	•											•	burrowing; digging; eating
Cat, domestic		•	•											•	noise; scent marking
Coyote		•				•				•					burrowing; digging; chewing
Deer species								•		•				•	collisions; trampling
Dog, domestic		•												•	digging; clawing; chewing
Fox, gray		•													burrowing; digging
Fox, red									•						burrowing; digging
Gopher, pocket		•												•	burrowing; digging; chewing
Gopher species		•				•									burrowing; digging; chewing
Marmot species		•							•						burrowing; digging
Mink						•									clawing; chewing
Mole species					•									•	burrowing; digging
Mountain lion										•				•	trampling
Mouse, house		•				•		•						•	chewing; defecation
Muskrat						•			•					•	burrowing; digging
Nutria									•					•	burrowing; digging
Opossum		•												•	chewing; nesting
Porcupine														•	chewing
Prairie dog species		•				•			•					•	burrowing; digging

(Continued)

Table 3-8 (Continued)

Mammal and Bird Damage to Facilities and Structures as Reported to APHIS ADC in FY 1988[a]

	Buildings				Recreation Areas			Other Structures							
Mammals and Birds	Barns	Buildings	Commercial/Industrial	Private Homes	Golf Courses	Public Property	Lakes/Pools/Reservoirs	Automobile Equipment	Dikes/Ditches/Irrigation	Fences	Landfills/Dumps	Telephonr Poles	Utilities	Nuisance[b]	**Activities Responsible for Damage**
Raccoon		•		•		•								•	chewing; nesting
Rabbit species		•												•	burrowing; digging
Rat species		•				•		•	•		•			•	burrowing; digging; chewing; nesting; defecation
Skunk, spotted		•		•										•	burrowing; digging; odors
Skunk, striped		•		•		•			•	•				•	burrowing; digging; odors
Squirrel, flying		•		•		•								•	chewing; nesting; defecation
Squirrel, Eastern fox		•		•		•		•						•	chewing; nesting; defecation
Squirrel, gray		•		•		•								•	chewing; nesting; defecation
Squirrel, ground species		•		•		•		•	•					•	burrowing; digging
Woodchuck				•										•	digging; chewing; nesting
Birds															
Blackbird group		•		•				•						•	roosting; defecation
Crow species		•	•			•							•		nesting
Egret species														•	noise; defecation
Goose/duck species		•	•		•	•	•		•				•	•	feeding; nesting; defecation
Gull species	•	•	•	•	•	•	•	•			•		•	•	roosting; nesting; defecation
Heron species														•	roosting
Mockingbird		•													nesting
Osprey													•		nesting

(Continued)

Table 3-8 (Continued)

Mammal and Bird Damage to Facilities and Structures as Reported to APHIS ADC in FY 1988[a]

	Buildings				*Recreation Areas*			*Other Structures*							
Mammals and Birds	Barns	Buildings	Commercial/Industrial	Private Homes	Golf Courses	Public Property	Lakes/Pools/Reservoirs	Automobile Equipment	Dikes/Ditches/Irrigation	Fences	Landfills/Dumps	Telephonr Poles	Utilities	Nuisance[b]	**Activities Responsible for Damage**
Owl, barn			•												nesting
Pigeon (rock dove)	•	•	•	•		•		•						•	nesting; roosting; defecation
Raven species					•										nesting; roosting
Robin, American						•									nesting; roosting
Sparrow species		•		•				•						•	nesting; roosting; defecation
Starling	•	•	•	•				•						•	nesting; roosting; defecation
Swallow/martin species	•	•				•									nesting; roosting; defecation
Woodpecker species		•	•	•		•						•		•	pecking; nesting
Vulture species		•	•			•					•		•	•	nesting; roosting; defecation

[a] Information obtained from FY 1988 ADC State annual reports.
[b] Nuisance reports also were received for lizards and snakes.

In most instances, wildlife is drawn to an airport by the presence of food, water, and resting, roosting, or nesting sites. Birds commonly attracted to airports include cattle egrets, sparrows, finches, starlings, mourning doves, gulls, crows, pigeons, raptors, ducks, and geese. The grass and shrubbery at airports often provide suitable habitat for small mammals that attract raptors such as owls, hawks, and falcons, creating a collision hazard for aircraft operations. Airport safety is also jeopardized by birds attracted to garbage dumps or sanitary landfills located near airports. Open water and wetlands also attract a variety of birds, including gulls, waterfowl, shore birds, and marsh birds, which come to feed on aquatic plant and animal species or to rest.

Bird roosting and nesting activities in structures at airports also may represent important problems. Starlings, pigeons, sparrows, swallows, and other birds often inhabit the interiors of hangars and may damage equipment and aircraft engines. In addition, bird droppings on external parts of aircraft may cause corrosion and deterioration, making them unsafe for operation.

Flocks of migratory birds may be a significant hazard to aircraft. Most of these hazards occur along migration corridors within the four principal administrative bird flyways (USDOT 1978, 1984; Belrose 1980). The seasonal dates and size of the individual migratory flocks vary from season to season depending on a variety of factors.

Generally, bird collisions occur when aircraft are near the ground. Over 45 percent occur within 100 feet of the ground, and over 75 percent of all bird aircraft strikes occur within 1,500 feet of the ground (USDOT/FAA 1978; 1984). Bird strikes for 1978, reported by flight phase, altitude, components struck, and species responsible for aircraft strikes, are summarized in Table 3-9.

Airports provide habitat for many mammal species. Aircraft collisions with deer, moose, coyotes, and other mammals occur, but they are less frequent than bird strikes. Damage also may result from gophers chewing on runway, approach, and clearance lighting cables.

Table 3-9

Summary of Bird Strikes in 1978

Phase of Flight When Struck		*Reported Altitude When Struck*		*Aircraft Components Struck*		*Species Responsible for Strikes*	
Flight Phase	**Percent of Strikes**	**Altitude (feet)**	**Percent of Strikes**	**Component**	**Percent Struck**	**Species**	**Percent of Strikes**
Takeoff	28.0	Above 3,000	14.0	Windshield	22.7	Gulls	43.4
Landing	23.0	2,501 to 3,000	2.9	Engines	21.7	Unknown (mixed species)	20.2
Approach	22.0	2,001 to 2,500	2.9	Wing	20.0	Blackbirds/Starlings	11.3
Climb	12.0	1,501 to 2,000	4.0	Radome/Nose	17.6	Raptors	9.6
Cruise	7.0	1,001 to 1,500	6.6	Fuselage	16.0	Ducks	8.1
Holding/letdown	5.0	501 to 1,000	7.3	Tail	2.0	Geese	4.8
Unknown	3.0	101 to 500	16.4			Egrets	2.6
		0 to 100	45.9				

Source: USDOT 1978.

b. Disease Control

Another function of the current APHIS ADC program is to assist public health agencies in the control of wildlife-borne diseases that are transmissible to humans or livestock. Many wildlife-borne diseases exist in the United States, and requests for APHIS ADC assistance in the control of these diseases are common. Some diseases of concern are described in the following paragraphs.

Rabies is a viral disease that attacks the autonomic nervous system in humans. Direct transmission of this viral disease among mammals usually is the result of exposure to the bite or saliva of an infected animal. In the United States, where canine rabies is controlled mainly by vaccination, the bites of infected wild animals have caused most cases of human rabies since 1960 (Merck, Sharp, and Dohme Laboratories 1987). Primary wildlife vectors for rabies in the United States include the skunk; raccoon; red, gray, and arctic foxes; and various species of bats. Rabid wild animals may show erratic behavior, but less obvious changes (e.g., diurnal activity of normally nocturnal bats, skunks, and foxes or lack of normal fear of humans) also are signs of rabies infection (Merck, Sharp, and Dohme Laboratories 1987).

ADC personnel often cooperate with public health agencies in sampling wild animals to determine the incidence of wildlife-borne diseases.

During FY 1988 California reported 394 cases of rabies in wild and domestic animals. Texas reported rabid skunks and bats; New Mexico reported a rabid house cat and horse, with skunks as the suspected vector species; and Georgia reported rabid skunks. The skunk is the most common vector for rabies (Sikes 1970; Merck, Sharp, and Dohme Laboratories 1987).

Plague, referred to as the Black Death during the Middle Ages, is found in the United States in areas of west and north-central Texas, New Mexico, Arizona, and California. Plague is caused by the bacterium *Yersinia pestis*. It is carried primarily by wild rodents, including rats, mice, squirrels, and prairie dogs. Plague is transmitted from rodents to humans by the bite of an infected flea. Although the occurrence of human plague infection is uncommon, individuals can be exposed to the bacterium by handling infected animals. During FY 1988 an outbreak of bubonic plague occurred in a 14-county area in Texas. APHIS ADC personnel played an important role by providing field specimens for testing by the Texas Department of Health.

Histoplasmosis, a disease that can affect humans, is caused by the inhalation of spores of the fungus *Histoplasma capsulatum*. Often called "cave sickness" or "summer flu," the disease has affected an estimated 30 million Americans (U.S. Department of Health and Human Services 1984). The infection is not easily diagnosed; however, fatal cases are relatively rare. The fungus proliferates in soil enriched by bird or bat droppings. Wildlife species commonly associated with soil enrichment include bats, blackbirds, starlings, gulls, and pigeons. Common infection sites in urban and rural environments include barns, blackbird/starling roosts, caves, chicken houses, and pigeon lofts. Prevention of large accumulations of bird droppings and decontamination of soil enriched by bird feces may limit the potential for human infection.

During FY 1988 histoplasmosis was reported in Indiana and South Carolina. In Indiana, late summer and fall pigeon roosts resulted in 17 individual cases of histoplasmosis. APHIS ADC personnel provided information on control and dispersal actions to prevent pigeons from congregating. In South Carolina, blackbird roosts resulted in one confirmed case of histoplasmosis, which aroused public concern about the disease and its control. APHIS ADC personnel recommended alteration of habitat and removal of bamboo to limit the availability of blackbird roost sites.

Murine typhus, more commonly known as murine typhus fever, is found throughout the Southeastern and Gulf Coast States, as well as southern California (Henderson 1983). Murine typhus is caused by *Rickettsia typhi*. This disease is transmitted to humans from rats through the bite of a flea. The oriental rat flea is considered to be the most important vector of the disease. The causative organism enters the circulatory system when fecal matter from infected fleas is scratched or rubbed into a flea bite or other wound. Murine typhus is similar to epidemic or louse-borne typhus, but the illness is much milder and the fatality rate in untreated cases is much lower.

During FY 1988, 14 cases of murine typhus were reported in Texas. APHIS ADC personnel in Laredo trapped opossums, rats, and mice as part of the control effort. In Indiana, APHIS ADC personnel responded to a case of murine typhus that was attributed to a flying squirrel.

A focus of the current APHIS ADC program is to assist public health agencies in the monitoring and control of rabies and plague. In the future, control activities may be directed at these and other wildlife-borne diseases.

C. Biological Environment

The following sections discuss some of the wildlife species affected or potentially affected by activities of the APHIS ADC program. Wildlife species may be either target or nontarget animals, depending on the damage situation. The focus of APHIS ADC program damage control activities is target species—birds and mammals that cause damage to crops, livestock, and other resources or present hazards to public health and safety. Nontarget species are animals that are inadvertently captured, injured, killed, or otherwise affected during the conduct of wildlife damage control activities. Mitigation measures that have been developed to minimize adverse impacts on nontarget species are discussed in Chapter 5.

1. Target Species

While any species of animal may be a target at some time, 17 species or species groups were chosen for detailed assessment to determine the biological impacts of the current APHIS ADC program. The assessment methodology is described in Chapter 4. Impacts and potential impacts associated with these 17 species or species groups are considered representative of the types of impacts that result from damage control activities conducted by the APHIS ADC program throughout the United States in 1988. The 17 species meet the following criteria, making them the most appropriate representatives of all target species:

- Most of these species are regularly killed by APHIS ADC operations, leading to the potential for substantial impacts.
- These species are representative of the various birds and mammals and the types of damage that the APHIS ADC program controls.
- A wide range of chemical and nonchemical control methods is used to control damage by these animals.
- These species encompass a wide geographic range in the United States.
- Direct control of the damage caused by these species can be expected to continue in response to continuing problems.

The following sections discuss each of the species. Figures 3-1 through 3-17 present range maps for all 17 species and show the States where the species were killed by the APHIS ADC program in FY 1988. Table 3-10 presents a summary of biological data for the mammal species, and Table 3-11 presents primary foods and clutch sizes for the birds. Population estimates and trends and fur harvest data, where available, are presented in Chapter 4, along with the numbers of target and nontarget species killed by APHIS ADC program activities.

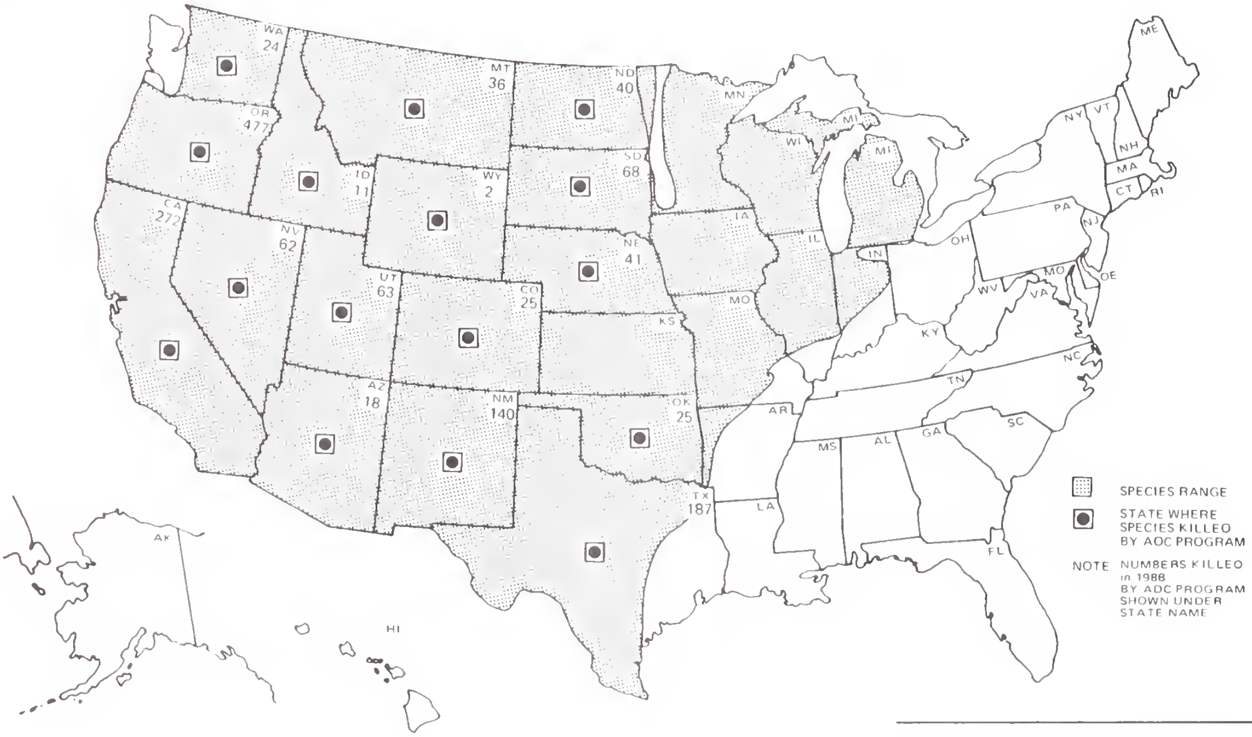
a. Mammals

(1) Badger *(Taxidea taxus)*

The range of the badger extends from the Great Lakes to the Ohio Valley and westward into the Great Plains and along the Pacific coast (Figure 3-1). Badgers are not found in the Eastern States or in certain areas of Oregon and Washington west of the Cascade Mountains. This species is state-listed as threatened in Indiana and Michigan.

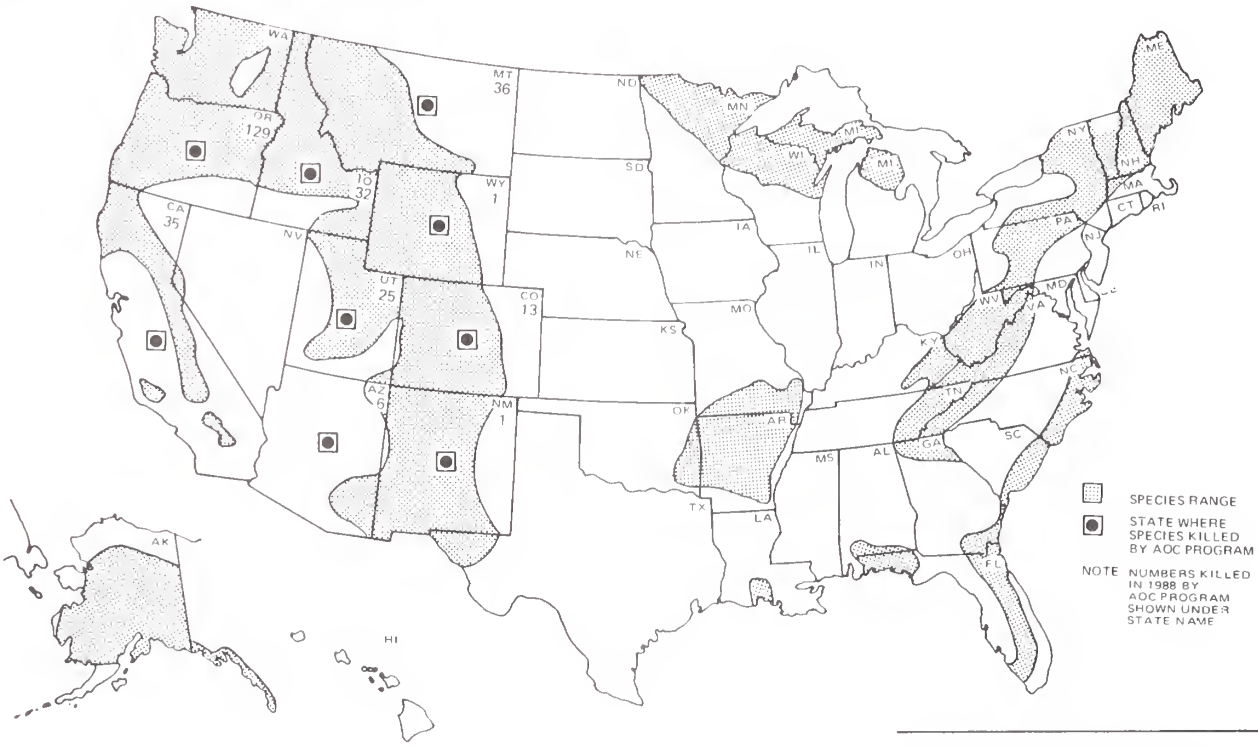
Badgers are carnivores that eat ground squirrels, prairie dogs, gophers, rabbits, mice, lizards, insects, birds, and eggs (Long and Killingley 1983). Badgers also may kill young lambs and domestic turkeys. Their burrows can be a hazard to livestock or farm machinery.

Figure 3-1 **Range of the Badger in the United States**[a]



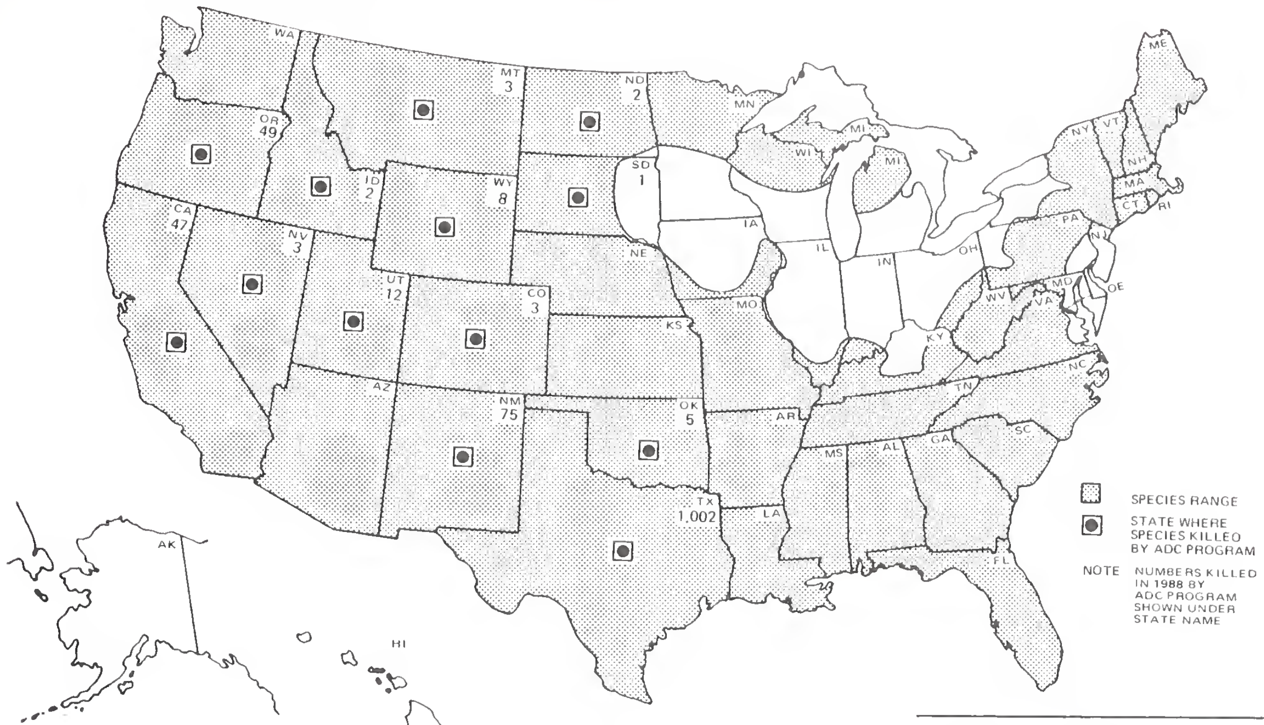
[a] Source: Long and Killingley 1983.

Figure 3-2 **Range of the Black Bear in the United States**[a]



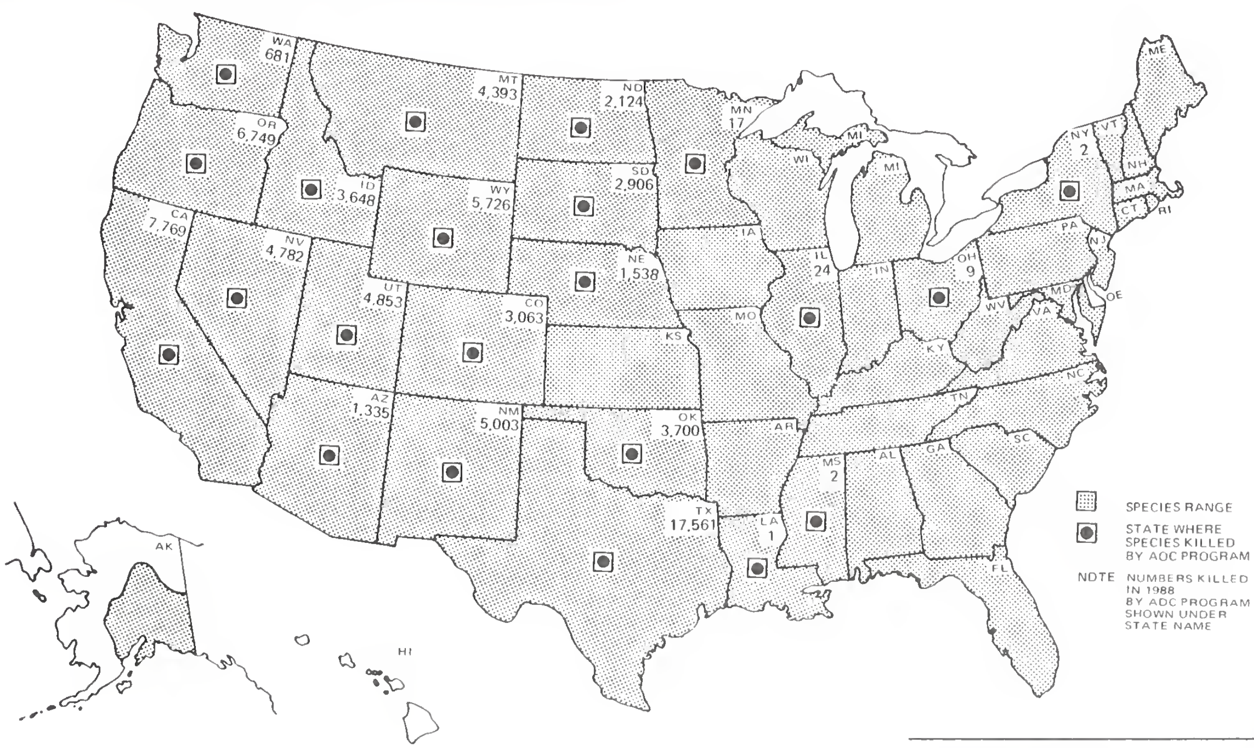
[a] Source: Novak et al. 1987a.

Figure 3-3 **Range of the Bobcat in the United States**[a]



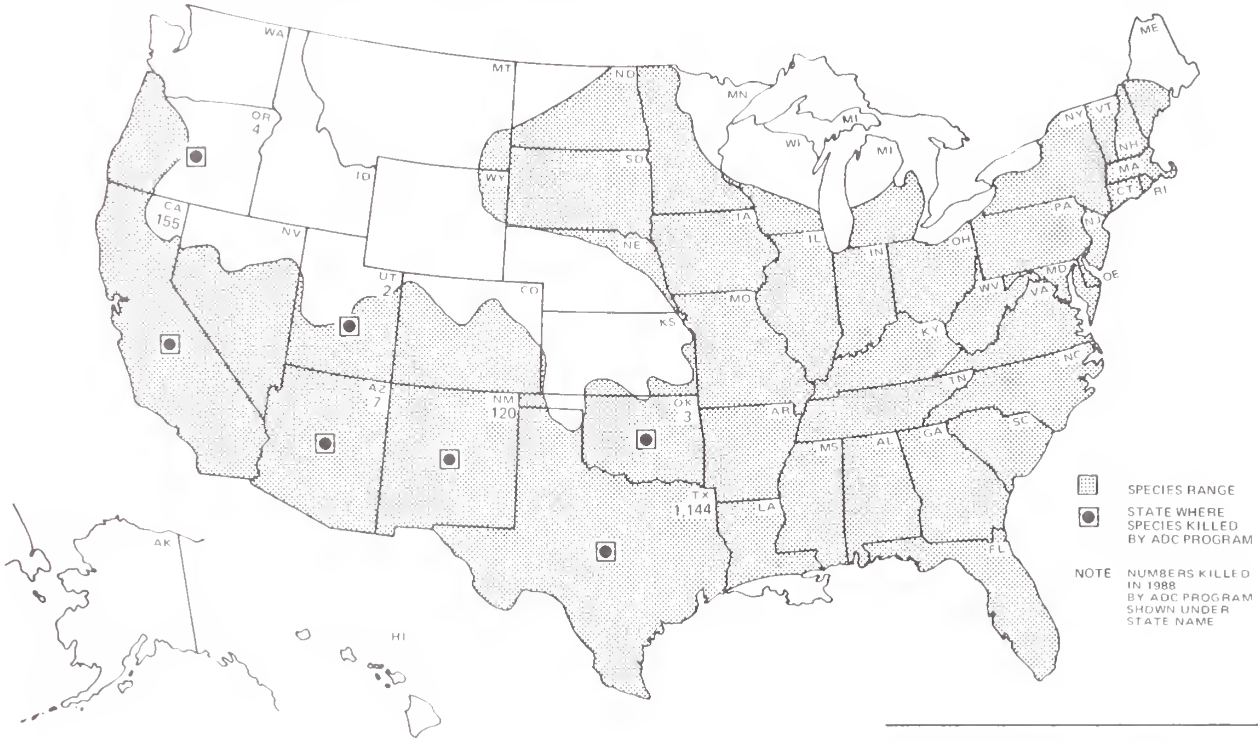
[a] Source: Novak et al. 1987a.

Figure 3-4 **Range of the Coyote in the United States**[a]



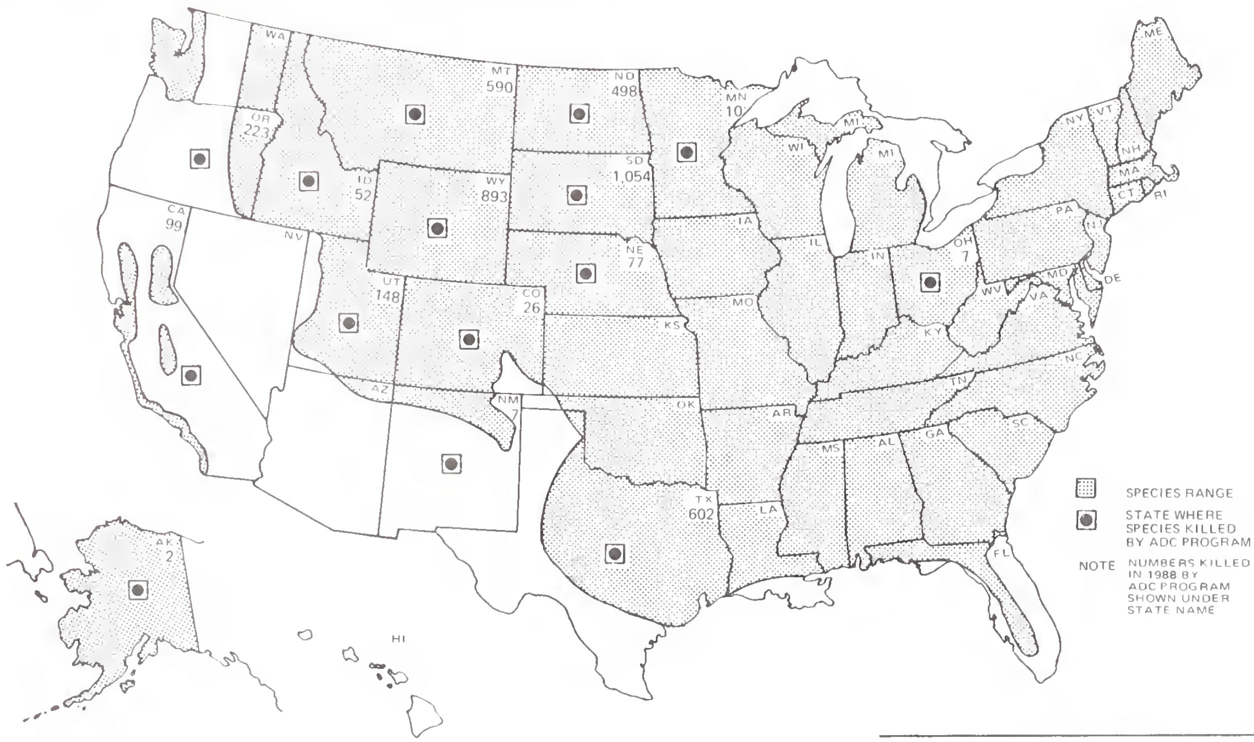
[a] Source: Bekoff 1977.

Figure 3-5 **Range of the Gray Fox in the United States**[a]



[a] Source: Novak et al. 1987a.

Figure 3-6 **Range of the Red Fox in the United States**[a]

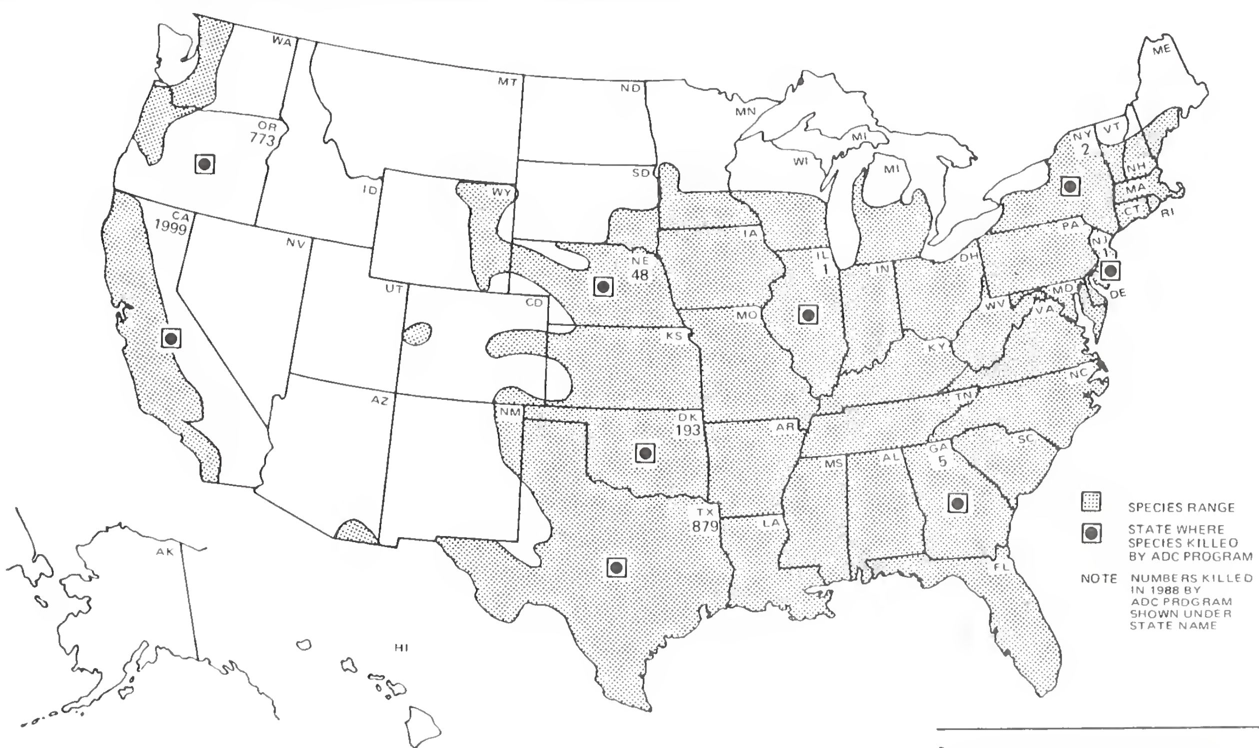


[a] Source: Novak et al. 1987a.

Figure 3-7 **Range of the Mountain Lion in the United States**[a]

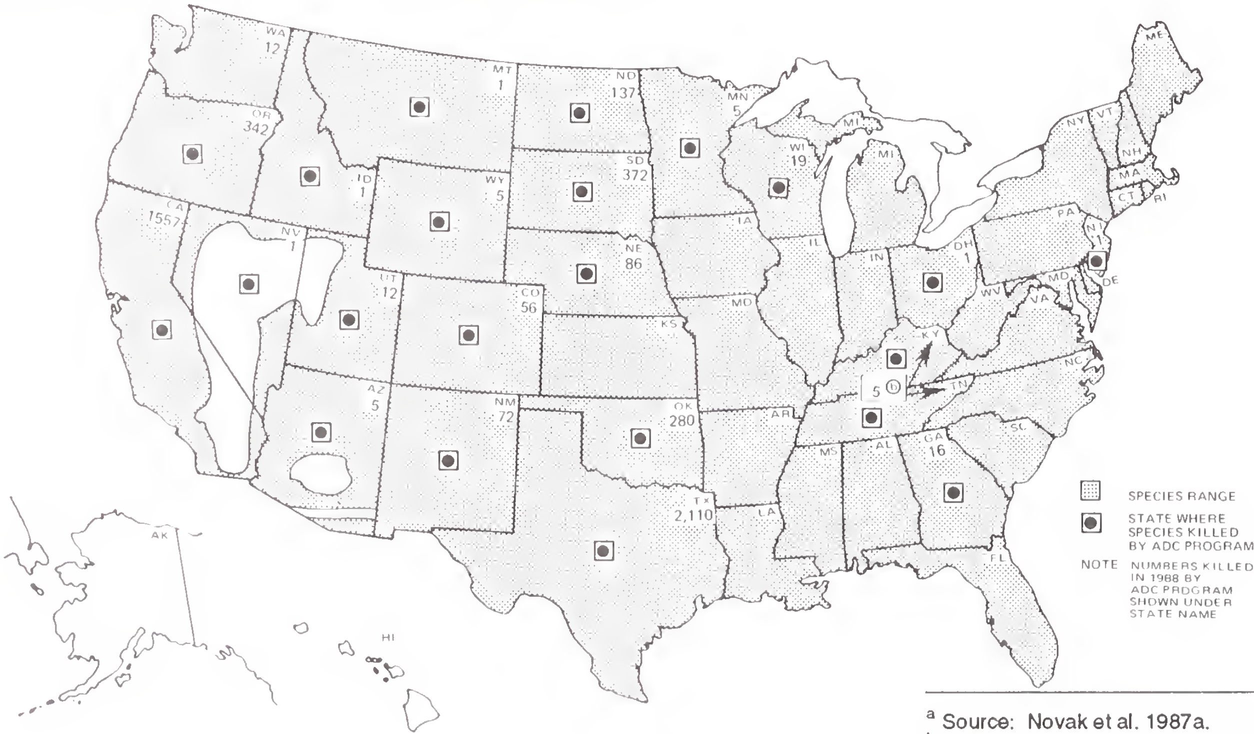
[a] Source: Novak et al. 1987a.

Figure 3-8 **Range of the Opossum in the United States**[a]



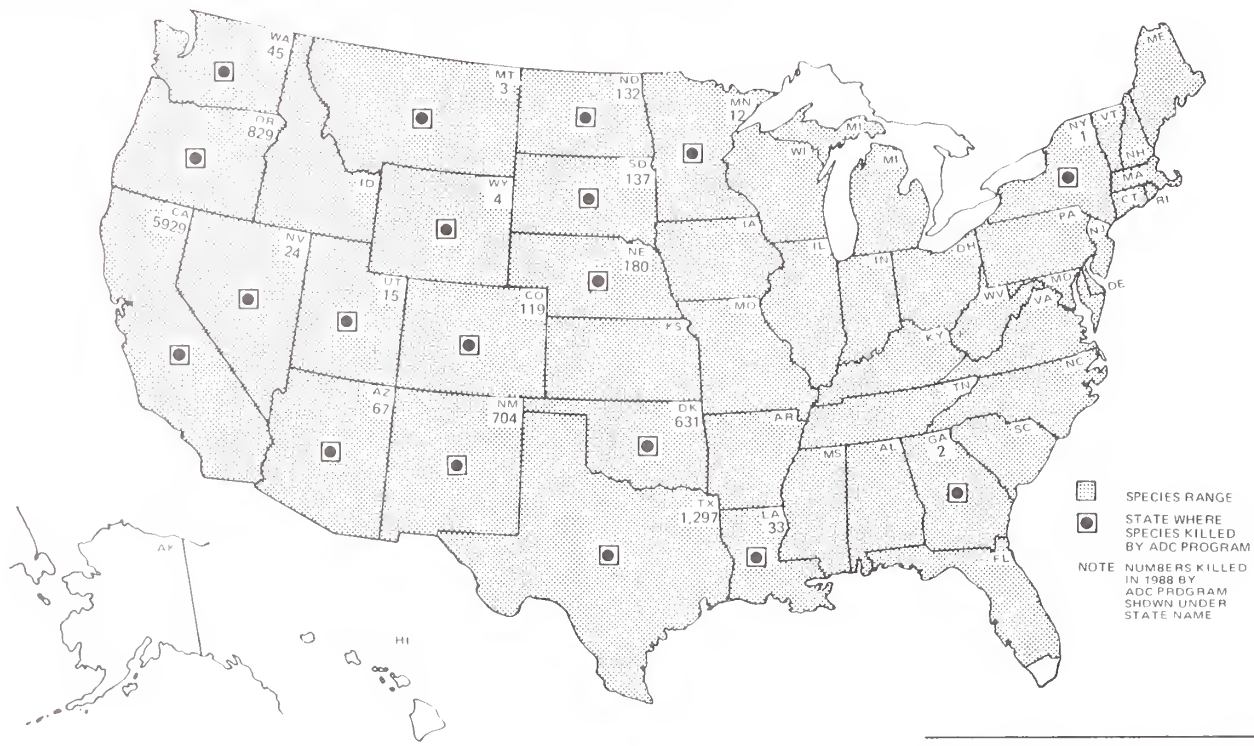
[a] Source: Novak et al. 1987a.

Figure 3-9 **Range of the Raccoon in the United States**[a]



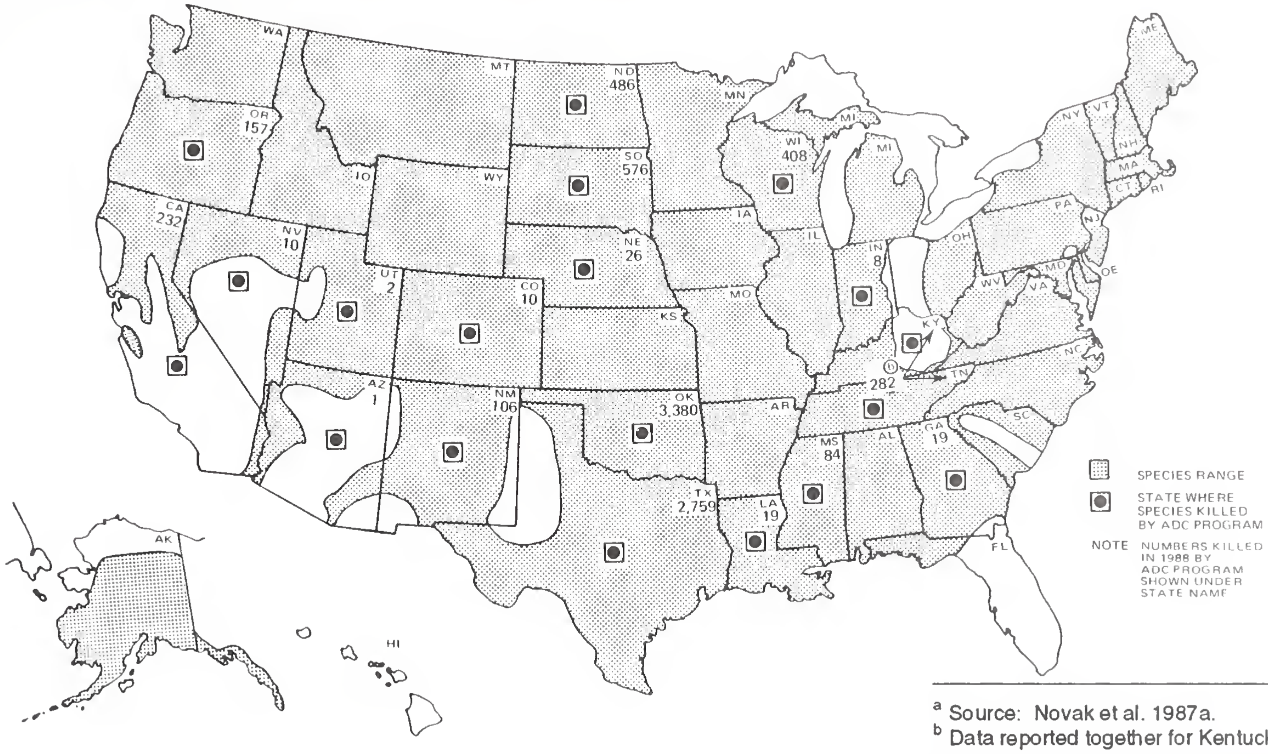
[a] Source: Novak et al. 1987a.
[b] Data reported together for Kentucky and Tennessee.

Figure 3-10 **Range of the Striped Skunk in the United States**



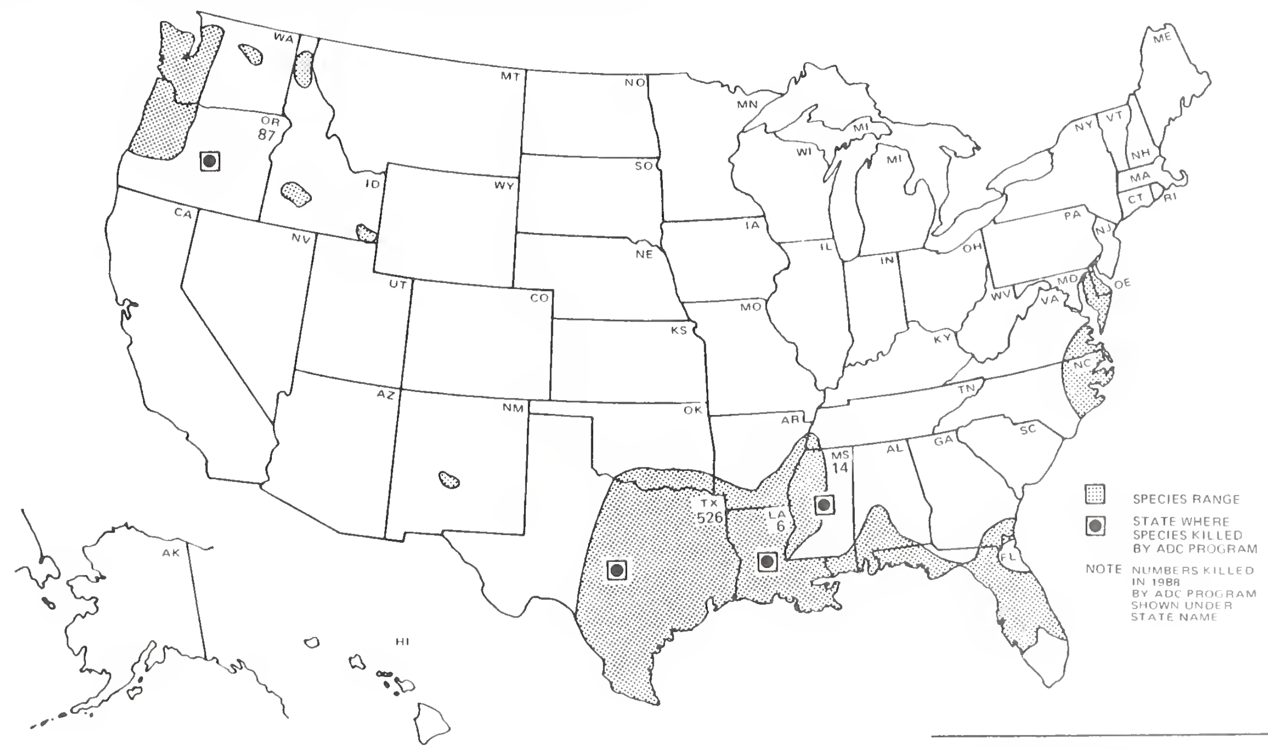
Source: Burt and Grossenheider 1976.

Figure 3-11 **Range of the Beaver in the United States**[a]



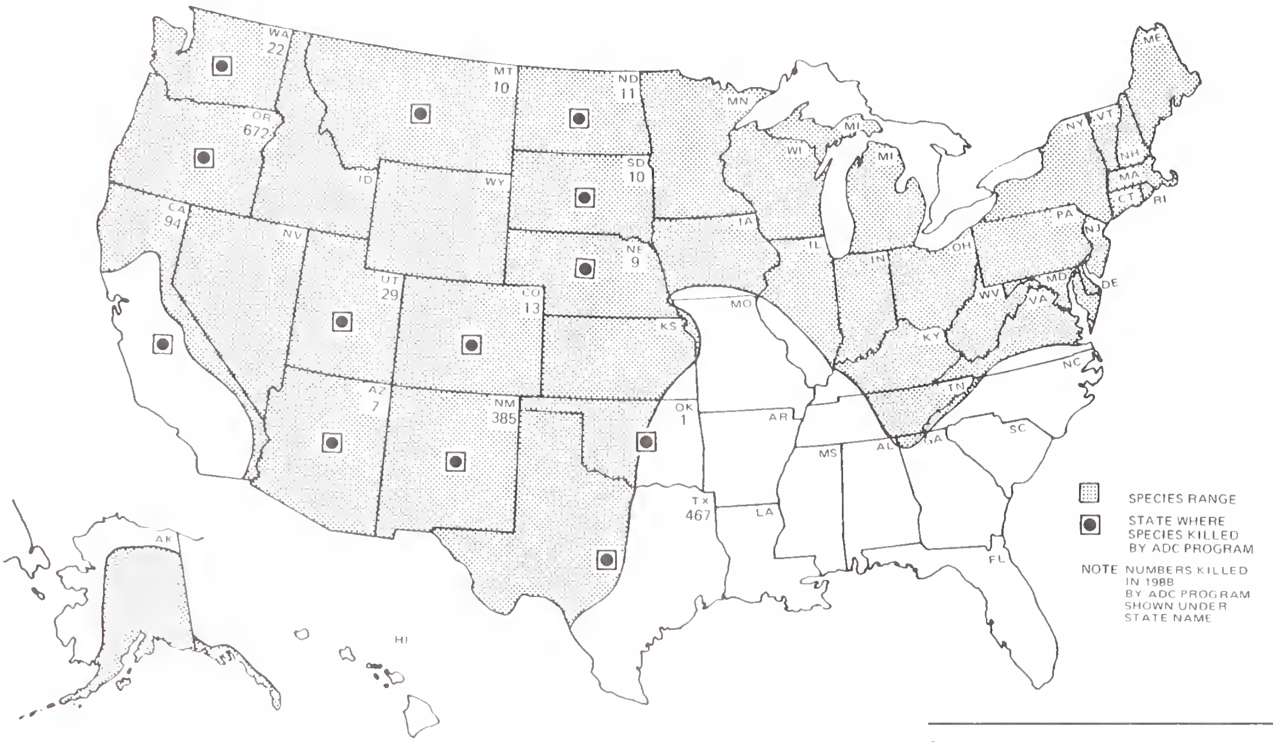
[a] Source: Novak et al. 1987a.
[b] Data reported together for Kentucky and Tennessee.

Figure 3-12 **Range of the Nutria in the United States**[a]



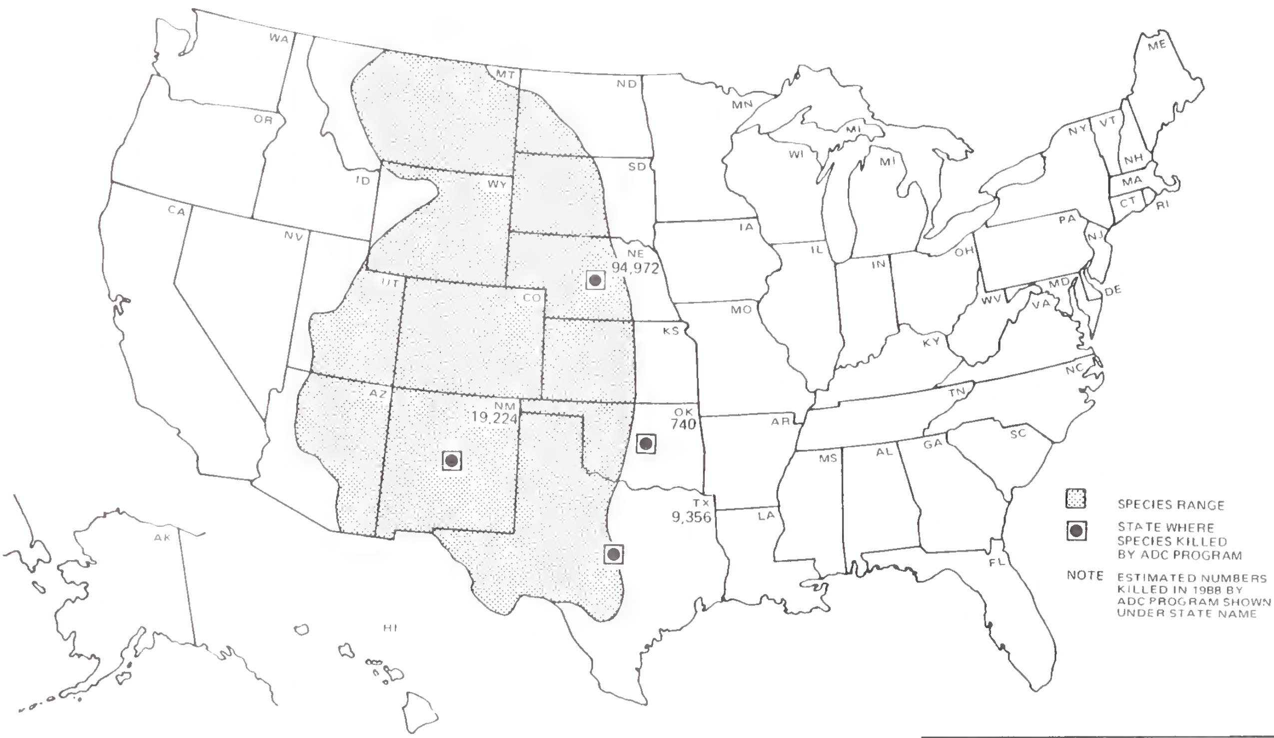
[a] Source: Novak et al. 1987a.

Figure 3-13 **Range of the Porcupine in the United States**[a]



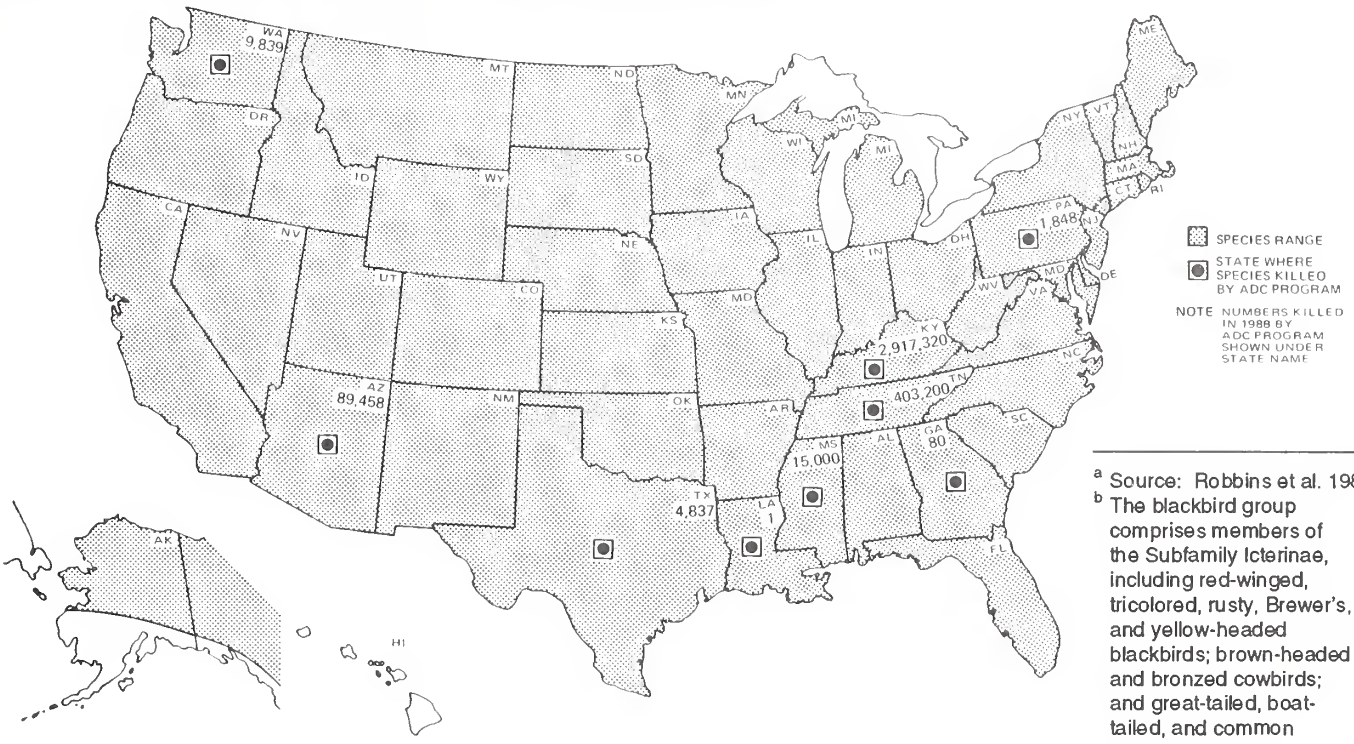
[a] Source: Hall 1981.

Figure 3-14 **Range of the Prairie Dog in the United States**[a]



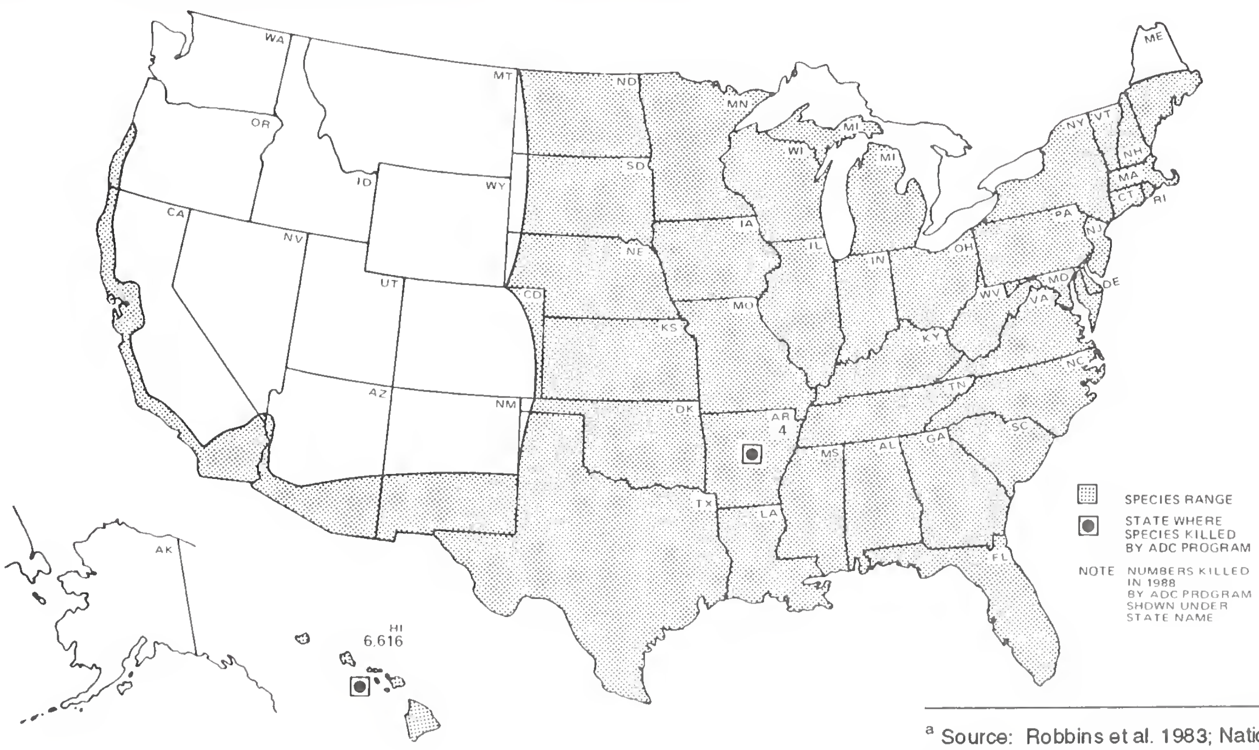
[a] Source: Burt and Grossenheider 1976.

Figure 3-15 **Range of the Blackbird Group in the United States**[a,b]



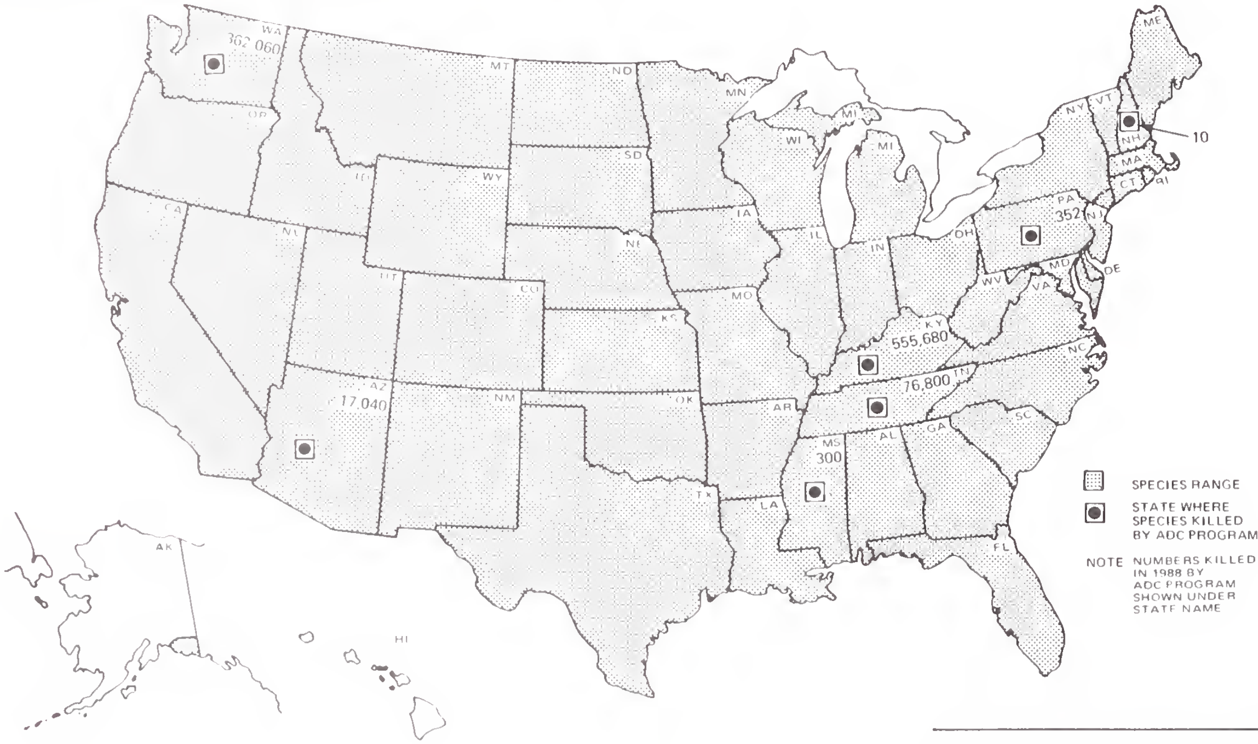
[a] Source: Robbins et al. 1983.
[b] The blackbird group comprises members of the Subfamily Icterinae, including red-winged, tricolored, rusty, Brewer's, and yellow-headed blackbirds; brown-headed and bronzed cowbirds; and great-tailed, boat-tailed, and common grackles.

Figure 3-16 **Range of the Cattle Egret in the United States**[a]



[a] Source: Robbins et al. 1983; National Geographic Society 1983; Pratt *et al.* 1987.

Figure 3-17 **Range of the Starling in the United States**[a]



[a] Source: Robbins et al. 1983.

Table 3-10

Age of Reproductive Maturity, Number of Young Per Litter, and Annual Mortality Rates for the 14 Principal Mammal Species Affected by the APHIS ADC Program

Mammal Species	Age of Reproductive Maturity	Number of Young per Litter	Percent Annual Mortality
Badger	1.5 years (1)	1-4 (1)	Not available
Black bear	3.5 years (2)	1-5 (3)	Juvenile: 20-70 (4) Adult: 10-20 (5)
Bobcat	9-12 months (6)	1-6 (6)	as high as 47 (7)
Coyote	1 year (8)	4-8 (8)	as high as 50 (9)
Gray fox	1 year (10)	4 avg. (10)	as high as 60 (11)
Red fox	1 year (12)	up to 13 (12)	as high as 80 (13)
Mountain lion	20 months (14)	1-6 (15)	Juvenile: 20-25 (16) Age 1-13: 5-12 (16)
Opossum	6 months (17)	1-15 (18)	Juvenile: 77-88 (19)
Raccoon	1 year (20)	2-7 (21)	Adult: 65 (22)
Striped skunk	1 year (23)	5-9 (23)	Not available
Beaver	21 months (24)	3-4 (25)	Juvenile: 42 (26) Age 10: 94-97 (27) Age 20: 99 (27)
Nutria	6 months (28)	1-13 (29)	1st year: 80 (30) 2nd & 3rd years: 60 (30)
Porcupine	1.5 years (31)	1, rarely 2 (31)	Not available
Prairie dog	1 year (32)	1-6 (32)	1st year: 50 (32)

References:

(1) Messick 1987
(2) Kohn 1982; Graber 1981
(3) Alt 1981; Kolenosky and Strathearn 1987; Rogers 1976
(4) Kolenosky and Strathearn 1987
(5) Fraser et al. 1982
(6) Crowe 1975; Koehler 1987
(7) Rolley 1985
(8) USDI 1981a; Voight and Berg 1987
(9) Nowak and Paradiso 1983a; USDI 1981a
(10) Nowak and Paradiso 1983b
(11) Lord 1961; Seton 1929
(12) Harris 1979; Nowak and Paradiso 1983c; Voight and McDonald 1984
(13) Voight et al. 1985
(14) Seidensticker et al. 1973
(15) Anderson 1983
(16) Tanner 1975
(17) Reynolds 1952
(18) Gardner 1982
(19) Sanderson 1961; Petrides 1949; Van Druff 1971
(20) Junge and Sanderson 1982; Fritzell et al. 1985
(21) USDI 1981c
(22) Sanderson 1951
(23) Wade-Smith and Richmond 1978; Wade-Smith et al. 1980
(24) Benson 1936
(25) Hediger 1970
(26) Henry and Bookhout 1969
(27) Gunson 1970
(28) Atwood 1950
(29) Wade and Ramsey 1986
(30) Willner et al. 1983
(31) Davis 1974b; Evans 1987
(32) Hoogland et al. 1987

Table 3-11

Primary Foods and Clutch Sizes for the Three Principal Bird Species or Species Groups Affected by the APHIS ADC Program

Blackbird Group		
Red-winged blackbird	Insects, small fruits, seeds, grain, and small aquatic life (3)	3-5 eggs (1)
Rusty blackbird	Insects, small fruits, seeds, grain, and small aquatic life (3)	4-5 eggs (1)
Yellow-headed blackbird	Insects, small fruits, seeds, grain, and small aquatic life (3)	3-5 eggs (1)
Brewer's blackbird	Insects, small fruits, seeds, grain, and small aquatic life (3)	3-5 eggs (1)
Tricolored blackbird	Insects, small fruits, seeds, grain, and small aquatic life (3)	5-6 eggs (2)
Brown-headed cowbird	Insects, small fruits, seeds, grain, and small aquatic life (3)	4-5 eggs (1)
Bronzed cowbird	Insects, small fruits, seeds, grain, and small aquatic life (3)	1-3 eggs (1)
Common grackle	Insects, small fruits, seeds, grain, and small aquatic life (3)	5 eggs (1)
Boat-tailed grackle	Insects, small fruits, seeds, grain, and small aquatic life (3)	3-4 eggs (1)
Great-tailed grackle	Insects, small fruits, seeds, grain, and small aquatic life (3)	3-4 eggs (1)
Cattle egret	Insects (1)	3-5 eggs (1)
European starling	Insects, seeds, and berries (3)	4-6 eggs (1)

References:
(1) Bull and Farrand 1977
(2) Harrison 1978
(3) Peterson 1980

This species reaches reproductive maturity at approximately 1.5 years of age. Females can bear one to four young following a 7-month gestation period (Messick 1987). Badger density varies depending on habitat and may be as high as 13 per square mile (Messick and Hornocker 1981; Lindzey 1971). They have been reported to live in the wild for up to 14 years (Messick et al. 1981; Crowe and Strickland 1975).

(2) Black Bear *(Ursus americanus)*

The black bear has a wide but patchy distribution in the United States (Figure 3-2). Black bears can be found throughout the Rockies and West Coast mountain ranges; the lower Mississippi Valley, Gulf Coast, and Florida; and the northern Great Lakes area, Appalachian Mountains, and Northeastern States. They are rare in New Jersey, Maryland, Kentucky, and West Virginia, and are state-listed as threatened in Mississippi and Florida and endangered in Alabama and Missouri. Black bears are found in forests, swamps, dense thickets, and mountainous areas. They also can be found in croplands, forest plantations, and orchards, where they may cause substantial damage (California Forest Pest Council 1988).

Black bears may cause structural damage to utility poles, and they may raid apiaries for honey and campsites for human refuse. Though they are omnivores and eat large quantities of berries, fruits, nuts, and grasses, they also kill or injure sheep, goats, and cattle (Seton 1929).

Female black bears reach reproductive maturity at approximately 3.5 years (Kohn 1982; Graber 1981). Following a 7- to 8-month gestation period, they may have one to five cubs (Rogers 1976; Alt 1981; Kolenosky and Strathearn 1987). Juvenile black bear annual mortality ranges between 20 and 70 percent, with orphaned cubs having the highest mortality (Kolenosky and Strathearn 1987). Natural mortality in adult black bears is approximately 10 to 20 percent (Fraser et al. 1982). Their density will vary between 0.3 and 3.4 per square mile, depending on habitat. Black bears can live up to 25 years (Rogers 1976).

(3) Bobcat *(Lynx rufus)*

The bobcat is found predominantly in swamps and brushy areas in the East (Novak *et al.* 1987a) and in rimrock and chaparral areas in the West (Burt and Grossenheider 1976) (Figure 3-3). It is less common in the Eastern States. The bobcat is state-listed as endangered in Iowa, Indiana, and Ohio, and as rare in Kentucky, West Virginia, Illinois, and New Jersey.

Bobcats are carnivores that primarily prey on rabbits, hares, rodents, and birds. They also will consume carrion and prey on fawns, opossums, raccoons, insects, and reptiles. Domestic prey of the bobcat include cats and dogs, poultry, and livestock (Miller and Speake 1979; McCord and Cardoza 1982).

This species reaches reproductive maturity at approximately 9 to 12 months and may bear one to six young following a 2-month gestation period (Crowe 1975; Koehler 1987). Bobcat density ranges between 0.1 and 7 per square mile. They may live up to 14 years, but annual mortality is as high as 47 percent (Rolley 1985).

(4) Coyote *(Canis latrans)*

The coyote is found in all States except Hawaii and Delaware (Figure 3-4). Coyotes continue to expand their range, and their abundance continues to increase (Slate 1987; Bekoff 1977). They inhabit brush, prairies, and plains, as well as wooded and mountainous areas. This species has adjusted well to coexistence with humans.

Coyotes eat a variety of foods, including carrion, eggs, insects, berries, melons, and other fruits and vegetables. They also prey on rodents, rabbits, birds, reptiles, poultry, and livestock (Niebauer and Rongstad 1977; Berg and Chesness 1978; Huegel 1979; Weaver 1979).

This species reaches reproductive maturity at approximately 1 year. Following a 2-month gestation period, coyotes may bear four to eight pups (USDI 1981a; Voight and Berg 1987). Coyote density varies from 0.3 to 5 per square mile (Clark 1972; Gier 1975). Coyotes may live up to 14.5 years, but annual mortality has been reported as high as 50 percent (USDI 1981a; Nowak and Paradiso 1983a).

(5) Gray Fox *(Urocyon cinereoargenteus)*

The gray fox inhabits brushy and wooded areas, abandoned farm land, hedgerows, and chaparral throughout the United States, with the exception of the Northwestern States (Figure 3-5).

This omnivore eats birds, poultry, rabbits, eggs, insects, carrion, fleshy fruits, and grains. Gray foxes can climb trees and may damage orchard crops by climbing and eating the fruit before it can be harvested.

Gray foxes reach reproductive maturity at approximately 1 year and will bear an average of four pups following a 2-month gestation period (Nowak and Paradiso 1983b). Their density ranges between 3.1 and 5.4 per square mile (Trapp 1978). Gray foxes have been reported to live up to 15 years, but annual mortality may be as high as 60 percent (Seton 1929; Lord 1961).

(6) Red Fox *(Vulpes vulpes)*

The red fox inhabits most of the United States with the exception of Hawaii, portions of Florida and Louisiana, southwestern prairies and deserts, and the coastal areas of Oregon (Figure 3-6).

This omnivore eats rabbits, rodents (particularly voles and mice), insects, birds, reptiles, amphibians, fruit, and corn. The red fox is a major rabies vector (MacInnes 1987).

Red foxes are reproductively mature at 1 year and can bear up to 13 young following a 2-month gestation period (Harris 1979; Nowak and Paradiso 1983c; Voight and McDonald 1984). Densities range from 0.3 to 2.6 per square mile. Red foxes may live up to 12 years, but annual mortality has been reported as high as 80 percent (Voight et al. 1985).

(7) Mountain Lion *(Felis concolor)*

The mountain lion, including several endangered subspecies, is found in mountain, forest or swamp habitats. These habitats are found mostly in the Western States, portions of the Texas gulf coast, southern Florida (Figure 3-7).

Deer usually constitute a staple component of the mountain lion's diet. They also eat elk, porcupines, beavers, gophers, rats, squirrels, rabbits, and livestock (Shaw 1979). They may return to a carcass to feed for several days.

Female mountain lions may reach reproductive maturity at 20 months, but breeding depends on social status in the population (Seidensticker et al. 1973). Litter size varies from one to six kittens following a 3-month gestation period (Anderson 1983). Mountain lions have reportedly lived in captivity up to 18 years (Burt and Grossenheider 1976). Juvenile mortality among mountain lion kittens is approximately 20 to 25 percent, while mortality for lions ages 1 to 13 is estimated at 5 to 12 percent (Tanner 1975). Estimating density for a solitary, mobile predator like the mountain lion is difficult; however, densities of 0.013 to 0.13 per square mile were reported by Anderson (1983).

(8) Opossum *(Didelphis virginiana)*

Opossums are common in agricultural, wooded, and urban areas of the Eastern and Central States and along the west coast (Figure 3-8).

This omnivore has an appetite for birds and eggs, as well as mice, young rabbits, insects, carrion, snails, worms, crayfish, corn, nuts, berries, and garbage (Gardner 1982). Opossums are frequent pests at poultry houses.

Female opossums reach reproductive maturity at approximately 6 months (Reynolds 1952). Following a 13-day gestation period, one to 15 young may be born (Gardner 1982). Mortality for the young is high, ranging from 77 to 88 percent, and life expectancy rarely exceeds 1 year (Petrides 1949; Sanderson 1961; Van Druff 1971). Opossum density is highly variable depending on habitat and ranges from 10 to 634 per square mile (Sanderson 1961; Verts 1963; Holmes and Sanderson 1965).

Coyotes readily attack domestic animals much larger than themselves.

(9) Raccoon *(Procyon lotor)*

The raccoon inhabits wooded areas, fields, and urban areas situated near water throughout most of the United States (Figure 3-9). Raccoons seek cover in hollow trees or logs, in squirrel nests, in rock crevices, under windfalls, underground, or in buildings or storm drains.

Raccoons are omnivores that eat a varied diet of nuts, fruits, insects, frogs, eggs, fish, small mammals, crayfish, crabs, snails, and earthworms. They also will eat poultry, eggs, corn, and garbage. The raccoon is the major carrier of rabies in the Eastern United States (Kappus et al. 1970; Bigler *et al.* 1973; Nettles et al. 1979).

This species reaches reproductive maturity at approximately 1 to 2 years (Junge and Sanderson 1982; Fritzell et al. 1985). Following a 2-month gestation period, two to seven young are born (USDI 1981e). Annual mortality is approximately 65 percent, with a life expectancy of generally 2 to 3 years (Sanderson 1951). Raccoons may reach a density of 15 to 80 per square mile (Yeager and Rennels 1943). Raccoon densities may be higher in urban areas than in rural areas (Hoffmann and Gottschang 1977; Slate 1980).

(10) Striped Skunk *(Mephitis mephitis)*

The striped skunk can be found in many habitats throughout the United States (Figure 3-10).

Striped skunks have a preference for eating insects, spiders, amphibians, reptiles, rodents, turtles, and eggs. They also eat corn, fruits, nuts, and berries (Ewer 1973). Skunks also may raid beehives and garbage containers, may damage golf courses and gardens by digging for grubs, and can do extensive damage in poultry houses. The striped skunk is the principal rabies vector in the United States (Sikes 1970).

Striped skunks are sexually mature at approximately 1 year. Following a 2-month gestation period, five to nine young may be born (Wade-Smith and Richmond 1978; Wade-Smith et al. 1980). Skunk density is highly variable depending on habitat, and may range from 9 to 37 per square mile (Verts 1967). Life expectancy is usually about 3 years, though 10-year-old striped skunks have been reported in the wild (Linduska 1947; Verts 1967).

(11) Beaver *(Castor canadensis)*

The beaver is found throughout the United States, with the exception of Hawaii and portions of Florida, the Midwest, and the Southwest (Figure 3-11). Beavers are found in habitats containing bodies of water with adjacent woodland or brushy vegetation.

This species can greatly alter its habitat through dam building activities. Beaver dams create wetlands, which provide habitats for a variety of wildlife; however, dams also can cause flooding damage to property, roads, crops, and forests. Beaver dams have long-term effects on soil fertility, water chemistry, plant succession, and the rate of forest growth.

Beavers are herbivores that prefer to eat cottonwood, willow, aspen, birch, fruit trees, and other similar species. In northern climates, these animals actively cache food prior to winter.

Female beavers reach reproductive maturity at approximately 21 months (Benson 1936). Following a gestation period of 105 to 107 days, an average of three or four young are born (Hediger 1970). Mortality within the first year is approximately 42 percent (Henry and Bookhout 1969). It has been estimated that only 3 to 6 percent of kits survive to 10 years of age, and only 1 percent survive to age 20 (Gunson 1970). Beaver density reportedly ranges from 0.4 to 12 families per square mile, with family size varying between 3.2 to more than 8.2 individuals (Novak 1987).

(12) Nutria *(Myocastor coypus)*

Nutria primarily inhabit brackish or freshwater marshes but also are found in swamps, rivers, and lakes. They live in dense vegetation, in abandoned burrows, or in burrows they dig along stream banks or shorelines (Wade and Ramsey 1986). They are found in eastern Maryland, Delaware, Virginia, and North Carolina; the Gulf Coast States; western Washington and Oregon; and isolated areas of the Rocky Mountains (Figure 3-12).

This introduced species from South America competes with the native muskrat. It feeds on valuable wetland vegetation and crops such as sugar cane and rice (Wade and Ramsey 1986). Its burrowing activities can severely damage levees, dikes, earthen dams, and other structures.

Nutria reach reproductive maturity at approximately 6 months (Atwood 1950). One to 13 young may be born following a 130-day gestation period, and nutria may have 2 litters per year (Wade and Ramsey 1986). Mortality among female nutria is estimated to be 80 percent in the first year and approximately 60 percent for the second and third years (Willner et al. 1983). Nutria density varies widely depending on habitat, and has been reported to range from 0.2 per acre (Willner et al. 1979) to 56 per acre (Wentz 1971).

(13) Porcupine *(Erethizon dorsatum)*

The porcupine occupies many habitat types in Western and Northern United States (Figure 3-13).

The diet of the porcupine consists of herbaceous plants, thin smooth bark, twigs, leaves, and fruits. Porcupines prefer ponderosa pine, Eastern hemlock, aspen, willow, and cottonwood (Hoffmeister 1986; Davis 1974b). Encounters with livestock often lead to injury and infection when their spines penetrate and remain in a domestic animal's flesh.

Porcupines reach reproductive maturity at approximately 1.5 years. Following a 7-month gestation period, one or possibly two young may be born (Davis 1974b; Evans 1987). Porcupines reportedly have lived up to 15 years in the wild (Evans 1987).

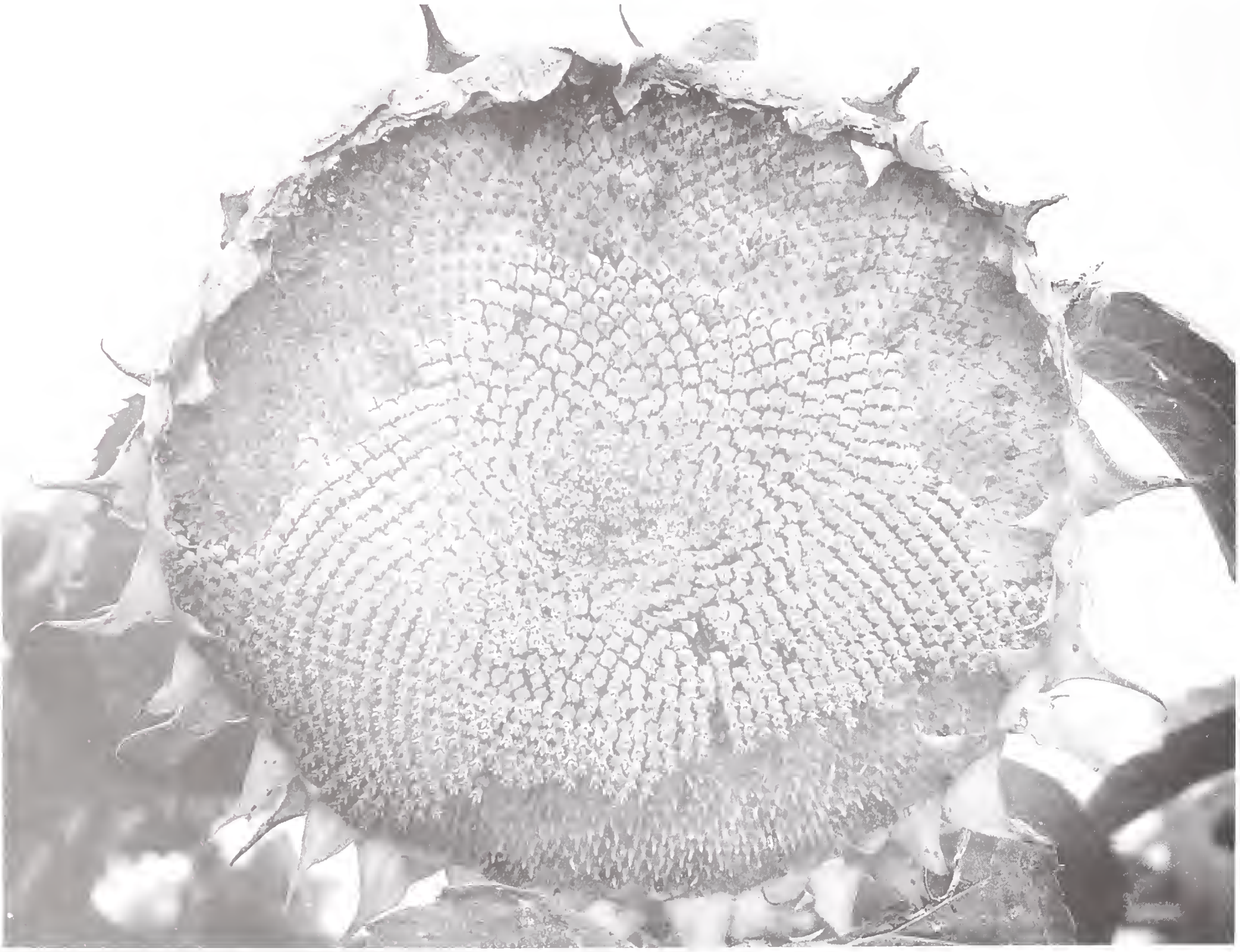
(14) Black-tailed and Gunnison's Prairie Dog *(Cynomys ludovicianus* and *C. gunnisoni)*

Prairie dogs range through the plains and intermountain States from Canada to Mexico (Figure 3-14). The black-tailed prairie dog inhabits western upland short-grass prairies from Montana to Texas, and the Gunnison's prairie dog inhabits open or brushy country in southwestern Utah, southwestern Colorado, western New Mexico, and Arizona. Black-tailed prairie dogs live in colonies known as "towns," while the Gunnison's prairie dog is less colonial.

The prairie dog's diet consists of assorted grains, herbs, grasses, cactus, and sometimes insects. Prairie dogs may compete with grazing livestock for food and can harbor fleas that transmit bubonic plague and tularemia (Boddicker 1983).

Their burrow systems can present a hazard to livestock and farm equipment and cause damage to crop roots. Livestock may be injured by stepping in a prairie dog hole, or farm machinery may become stuck in a collapsed burrow.

Prairie dogs reach reproductive maturity in 1 year, but usually do not breed until the second year. Litter size ranges from one to six, and the gestation period is 1 month. Mortality during the first year is approximately 50 percent, though male and female prairie dogs may live up to 5 and 7 years, respectively (Hoogland et al. 1987). Prairie dog density is highly variable depending on species and habitat and may reach up to 60 per acre (Boddicker 1983).



Forty-eight percent of this sunflower's seeds were consumed by blackbirds.

b. Birds

(1) Blackbird Group (Subfamily Icterinae)

The blackbird group comprises the Subfamily Icterinae, including red-winged, tricolored, rusty, Brewer's, and yellow-headed blackbirds, brown-headed and bronzed cowbirds; and great-tailed, boat-tailed, and common grackles. These birds can be found throughout the United States (Figure 3-15). Blackbirds can damage several kinds of crops, including corn, sunflowers, sorghum, oats, wheat, and rice.

The red-winged blackbird *(Agelaius phoeniceus)* is by far the most common member of the blackbird group, and its range extends from Canada to the West Indies and Costa Rica (Peterson 1980). These birds are abundant in marshes, fields, and woods, and they consume insects, small fruits, wild seeds, grain, and small aquatic life (Peterson 1980). Red-winged blackbirds nest in marsh or upland vegetation, and clutch size ranges from three to five eggs (Bull and Farrand 1977).

The rusty blackbird *(Euphagus carolinus)* can be found in Alaska and northern Canada, southern Canada, and the Northeastern United States. This species winters as far south as the gulf coast. Rusty blackbirds occupy nontidal forested wetlands during migration and boreal bogs during the breeding season. The preferred foods of the rusty blackbird include insects, small fruits, wild seeds, grain, and small aquatic life (Peterson 1980). These birds nest in dense shrubs or low trees near or over water, and normally have a clutch size of four or five eggs (Bull and Farrand 1977).

The yellow-headed blackbird *(Xanthocephalus xanthocephalus)* occupies a range that includes southern Canada, the western United States, and the upper Mississippi Valley to northwestern Mexico. It winters in the southwestern United States and Mexico (Peterson 1980). These birds inhabit nontidal wetlands and forage in fields and open country. The preferred foods of the yellow-headed blackbird include insects, small fruits, wild seeds, grain, and small aquatic life (Peterson 1980). These birds nest in colonies in marsh vegetation, and clutch size ranges from three to five eggs (Bull and Farrand 1977).

The Brewer's blackbird *(Euphagus cyanocephalus)* is a western blackbird, occupying a range that includes southwestern Canada and the north-central and western United States, as well as southern Mexico during the winter months (Peterson 1980). The Brewer's blackbird can be found in prairies, fields, and farmyards (Bull and Farrand 1977). This bird eats insects, small fruits, seeds, and small aquatic life, but is especially known to visit farms and stockyards in the winter where it feeds on grain (Peterson 1980; Bull and Farrand 1977). This blackbird often nests in hayfields, and clutch size ranges from three to five eggs (Bull and Farrand 1977).

The tricolored blackbird *(Agelaius tricolor)*, a western bird, inhabits parts of California and southern Oregon. This blackbird will eat various kinds of wild seeds or grain, as well as insects, small fruits, and small aquatic life, and is often found foraging in wet meadows, rice fields, and rangelands (Peterson 1980; National Geographic Society 1983). Tricolored blackbirds nest in large colonies in marshes. Their nests may extend into shrubs, trees, grain, or nearby crops (National Geographic Society 1983). The clutch size is usually four eggs, but occasionally five or six eggs are found in a nest (Harrison 1978).

The brown-headed cowbird *(Molothrus ater)* is the smallest member of the blackbird group. It is common throughout the United States and often is found near livestock. This bird inhabits agricultural land, fields, woodland edges, and suburban areas (Bull and Farrand 1977). The preferred foods of the brown-headed cowbird include insects, small fruits, wild seeds, grain, and small aquatic life (Peterson 1980). It is a social parasite that often lays its eggs in the nests of rarer bird species, such as the endangered Kirtland's warbler *(Dendroica kirtlandii)*.

The bronzed cowbird *(Molothrus aeneus)* occupies southern portions of Arizona, New Mexico, and south-central Texas through Mexico and Central America to western Panama. These birds generally are found in open country (pastures, ranches, parks, orchards, and roadside thickets). During the winter months, bronzed cowbirds form large flocks with other blackbird species (Bull and Farrand 1977). Bronzed cowbirds feed extensively on seeds and grain, as well as on insects, small fruits, and small aquatic life (Bull and Farrand 1977; Peterson 1980). They often follow livestock to eat insects flushed up by the animals, or to eat ticks off the necks and backs of the animals. The clutch size of the bronzed cowbird is usually one to three eggs, which it lays in the nests of other birds (Bull and Farrand 1977).

The common grackle *(Quiscalus quiscula)* occupies a range that includes Canada and the United States east of the Rockies (Peterson 1980). This bird inhabits croplands, fields, parks, lawns, and open woodland (Bull and Farrand 1977). The grackle has an extremely varied diet, which includes insects, crayfish, frogs, other small aquatic life, mice, nestling birds, eggs, sprouting and ripened grains, seeds (such as sunflowers), and

fruits (including citrus in Texas) (Bull and Farrand 1977; Peterson 1980). Cracked corn is one of their preferred foods. These birds form large flocks during migration and in winter roosts and often form breeding colonies. Common grackles usually nest in tall evergreens and have a clutch size of five eggs (Bull and Farrand 1977).

The great-tailed grackle *(Quiscalus mexicanus)* occupies a range that includes western Louisiana, Texas, and Arizona south to northern South America (Peterson 1980). These birds are found primarily in farm lands with scattered trees and thickets, as well as in coastal marshes, parks, and towns. The preferred foods of the great-tailed grackle include insects, small fruits, grain, other seeds, and small aquatic life (Peterson 1980). Great-tailed grackles nest in loose colonies, with a clutch size of three or four eggs (Bull and Farrand 1977).

The boat-tailed grackle *(Quiscalus major)* has a range from New Jersey to Texas along the Atlantic and Gulf Coasts. This species is an inland resident in Florida (Peterson 1980), and occupies swamps and marshes along the coast, as well as farmlands. The boat-tailed grackle has a highly varied diet that includes insects, small crayfish, crabs and shrimp, lizards, toads, frogs, and small mammals. In addition, this species consumes small grains, seeds, and fruit (Peterson 1980). The boat-tailed grackle nests in marsh grasses or bushes, with clutch sizes of three to four eggs (Bull and Farrand 1977).

(2) Cattle Egret *(Bubulcus ibis)*

The cattle egret, an old-world species, has expanded its range in North America (Figure 3-16). Florida, Texas, and Louisiana have the largest populations of cattle egrets in the United States. It also can be found in the central and eastern United States and Hawaii. Cattle egrets often are found near cattle, because grazing cattle stir up invertebrates that egrets feed on. The major problem caused by cattle egrets is their roosting activity. If roosts are located near airports, they may pose a hazard to aircraft operations. Roosts or rookeries in urban areas can present public health and safety or nuisance problems. Cattle egrets usually nest in colonies in wetlands. The clutch size usually is three to five eggs (Bull and Farrand 1977).

(3) European Starling *(Sturnus vulgaris)*

Starlings periodically have been introduced into the United States from Europe since 1850. These aggressive birds are now widely distributed in the 48 contiguous United States and the range has recently expanded to include southern Alaska (Figure 3-17). They gather in large, communal night roosts from late summer until spring and often roost with blackbirds. Their abundance has made them a pest in city parks, in suburbs, and on farms. The preferred foods of the starling include insects, seeds, and berries (Peterson 1980). Starlings may damage fruit crops, contribute to feedlot damage, and compete with native birds for nesting cavities. Starlings are cavity nesters, and the clutch size usually is four to six eggs (Bull and Farrand 1977).

2. Nontarget Species

As discussed previously, nontarget species are animals that are inadvertently captured, killed, or injured during the conduct of wildlife damage control activities. Many of the target species already discussed also may be taken as nontarget species in various control situations. This inadvertent taking of nontarget species can occur in several ways.

Nontarget species may be inadvertently attracted to baits placed for other species; animals that are similar in size, habitat requirements, and behavior are likely to be susceptible to the same capture methods. For example, swift foxes may be attracted to the bait placed for coyotes or other canids, resulting in capture by a leghold trap or death by an

M-44. Nontarget species also may be associated with target species or occur in the same habitats. For example, robins that roost with blackbird flocks may be killed if the roost is sprayed with PA-14, and deer or pronghorn antelope may accidentally step on leghold traps set for coyotes.

3. Threatened and Endangered Species

Threatened species are either not yet endangered but are likely to become so in the foreseeable future or are recovering from endangered status. Endangered species face extinction throughout all, or within a significant portion, of their range. Regulatory mandates now exist to avoid taking, either directly or incidentally, Federal- or state-listed threatened and endangered species [Endangered Species Act of 1973 (16 U.S.C. 1531-1543; 87 Stat. 884), as amended].

The Endangered Species Act (ESA) requires that Federal agencies meet certain criteria. One requirement under Section 7(a)(2) of the ESA is that Federal agencies, in consultation with the U.S. Fish and Wildlife Service (USFWS) or the National Marine Fisheries Service, ensure that their actions are not likely to jeopardize the continued existence of any federally listed endangered or threatened species or result in the destruction or adverse modification of their critical habitat. This consultation process is required if any agency determines that its action “may affect,” either positively or negatively, any listed species (Appendix F). The product of this consultation process is a biological opinion that states whether or not the proposed action is likely to jeopardize any listed species or adversely modify a critical habitat.

The APHIS ADC program complies with the ESA and will continue to do so. As part of this compliance, the APHIS ADC program enters into Section 7 Consultation with the USFWS when it is determined that program activities “may affect” a listed species. In February 1979, an APHIS ADC programmatic consultation considered potential impacts on 138 listed species (USDI 1979). On March 27, 1990, formal programmatic consultation was reinitiated with the USFWS. The Biological Opinion resulting from the Section 7 Consultation is included in Appendix F.

In addition to programmatic consultations, project-specific consultations are conducted when it is determined that APHIS ADC program actions “may affect” a listed species. For example, APHIS ADC requested consultation on a proposed coyote/kit fox study to be conducted involving coyote trapping in an area occupied by the federally listed endangered San Joaquin kit fox. It was determined that the trapping of coyotes could potentially have positive impacts by removing a predator of the kit fox, but it was also recognized that a potentially negative impact could result if kit fox are trapped inadvertently. A Biological Opinion was issued stating that the project would not jeopardize the kit fox. Specific terms and conditions were listed to minimize the incidental take of any kit fox.

Wildlife damage control activities can potentially have both negative and positive impacts on the same listed species. For example, activities to control coyotes in Texas could reduce interspecies competition for resources between the coyote and listed species such as the ocelot and the jaguarundi, but could be potentially harmful if these felids are inadvertently killed during control activities. Wildlife damage control activities commonly have only positive impacts on a listed species. For example, the removal of any avian or mammalian nest predator could potentially benefit listed sea turtles without having a negative impact on the turtles.

There are more than 300 threatened and endangered animal species listed at the Federal level in the United States. The APHIS ADC program tentatively identified about 125 animal species that could be affected by program activities (Appendix F). These species may be affected either positively or negatively or both. In addition, the APHIS ADC

program tentatively identified 22 species of plants that could be affected by damage control activities. APHIS ADC program activities do not have the potential to impact all threatened and endangered species, because many species occur only in places where the APHIS ADC program does not conduct control activities. Note that not all of these effects will be negative and that APHIS ADC program activities are managed to avoid negative effects.

In addition to compliance with the ESA, the APHIS ADC program cooperates with each State and follows State policies concerning state-listed threatened and endangered species. For many States, the "threatened, endangered, or rare" status of a species is based on the uniqueness of that species within that particular State, even though in adjoining States the same species is abundant. In some instances, the State protecting the species is located on the edge of the natural range of the species. In coordination with the individual State, the APHIS ADC program modifies control activities to comply with State regulations and minimize adverse impacts on protected species.

The activities of the APHIS ADC program may affect threatened and endangered species in several ways. First, threatened and endangered species may be directly protected through APHIS ADC involvement in programs designed to increase the numbers of that species. For example, direct predator control activities on the Aleutian National Wildlife Refuge in Alaska were designed to protect the Aleutian Canada goose by increasing nesting and fledgling success. Additionally, the APHIS ADC program may indirectly protect threatened and endangered species through programs designed to protect other resources or through technical assistance.

Under certain circumstances, a threatened or endangered species, such as the gray wolf or grizzly bear, may become a target species. Control activities are focused on preventing damages or reducing safety hazards and may include trapping and relocation or lethal removal. Such activities are conducted in compliance with specific USFWS authorization.

Finally, threatened and endangered species may be taken inadvertently as nontarget species. Under the Endangered Species Protection Program of the U.S. Environmental Protection Agency (EPA), use of pesticides that may be dangerous to threatened and endangered species is restricted. Through coordination with the USFWS and EPA, the APHIS ADC program is aware of the distribution and range of threatened and endangered species and restricts the use of pesticides accordingly.

Occasionally, a particular control method may be modified to reduce the possibility of capturing threatened and endangered species. For example, leghold traps set for coyotes in areas where San Joaquin kit foxes exist are equipped with underpan tension devices so that the traps are not likely to release, if stepped on by a fox.

D. Economic Environment

1. APHIS ADC Program Operations and Expenditures

The present APHIS ADC program represents one approach to controlling wildlife damage problems. In its annual congressional budgetary request, the agency estimates the resources protected by the APHIS ADC program. These are shown in Table 3-12, which presents program coverage in terms of total resources protected, number of requests for assistance, and other indicators. The agricultural resources protected represent varying proportions of the total agricultural resources in the United States. In 1988, for example, resources protected by APHIS ADC included approximately 10 percent of cattle; 70 percent of sheep; less than 1 percent each of corn, small grains, and hay; 4 percent of citrus orchards; and 6 percent of fruit and nut crops (U.S. Department of Commerce 1990).

Table 3-12

Resources Protected by APHIS ADC Program Activities (1988-1991)

	1988[a]	1989[b]	1990c	1991[a]
Number of Livestock Protected				
Sheep and goats	7,684,302	7,850,000	8,136,125	8,396,215
Cattle	10,608,711	10,799,326	10,841,00	10,941,000
Total	18,293,013	18,649,326	18,977,125	19,337,215
Crop Acres Protected				
Small grains	660,753	671,354	882,500	1,184,500
Sunflowers	274,161	243,150	246,353	286,353
Fruit/nut orchards	126,581	135,489	137,425	137,225
Hay, alfalfa, pasture	283,110	275,698	380,000	461,200
Citrus	35,400	36,000	36,500	36,500
Corn	41,119	45,989	56,200	156,800
Soybeans	13,151	17,583	15,500	15,400
Vineyards	106,258	115,412	117,300	140,300
Total	1,540,533	1,540,675	1,871,778	2,418,278
Range/Forest Acres Protected				
Range	8,328,550	8,420,000	7,325,400	7,326,400
Forest	1,104,072	1,121,650	2,253,200	3,550,200
Total	9,432,622	9,541,650	9,578,600	10,876,600
Health/Safety Accomplishments				
Airports	62	311	323	635
Rabies projects	23	38	24	28
Plague surveillance projects	263	285	260	261
Total	348	634	607	924
Number of Requests for Assistance				
Agriculture	52,317	54,008	73,000	99,200
Urban interests	3,635	7,089	43,500	84,100
Human health/safety	14,647	17,837	13,000	19,895
Industrial facilities	515	915	696	1,002
Natural resources	316	613	765	1,161
Total	71,430	80,462	130,961	205,358

Sources:
[a] APHIS ADC Information Package Transmittal December 20, 1992.
[b] USDA APHIS Explanatory Notes 1991.
[c] USDA APHIS Explanatory Notes 1992.

As Table 3-12 demonstrates, the APHIS ADC program's activities are not limited to protecting agricultural resources. The program also addresses public health and safety issues in urban and rural areas. For example, through its rabies monitoring projects, the APHIS ADC program assists in preventing the spread of this disease from animal to human populations. The APHIS ADC program addresses the potential threat to airline passengers and equipment from birds and deer through its cooperative agreements with the Federal Aviation Administration (FAA) and airport authorities. APHIS ADC program also provides services to urban interests (such as individual property owners), industrial facilities, and sites involving natural resources.

In addition to direct control and technical assistance activities, the APHIS ADC program includes a significant research and development component to support the APHIS ADC program. APHIS ADC research functions carried out by the Denver Wildlife Research Center (DWRC) include maintenance of EPA registrations for vertebrate pest control chemicals, establishment of new registrations, improvement of existing control technology, development of new technology, information and technology transfer, and technical assistance in all areas of program support and evaluation. DWRC scientists work closely with other APHIS ADC personnel in planning and carrying out studies to evaluate, develop, or improve APHIS ADC technology. Research activities are coordinated with program needs through a continuing process of priority ranking that includes soliciting and evaluating research suggestions, establishing lists of research needs, and periodic reexamination of research priorities.

As documented in Table 2-3, approximately $6.5 million were expended for research activities at DWRC in FY 1988. Of this total, about $5.6 million were contributed by APHIS ADC, and about $836,000 were contributed by Federal and non-Federal cooperators. The APHIS ADC program's congressionally approved budget for field activities for 1988 was about $14.3 million. In addition, about $12 million was contributed by other Federal and non-Federal cooperators. About $4.7 million was expended for administration of the program (see Table 2-3.)

A multiple State grouping of the program's federally appropriated APHIS ADC funds and cooperative funds for 1988 appears in Table 3-13. There are small differences in total values expressed in Tables 2-3 and 3-13. These differences result from small variations from State to State in categories used to report expenditures. Expenditures of federally appropriated and cooperative funds are higher in the western United States (and specifically in the Texas, Intermountain, and West Coast regions) than in the East. This pattern of expenditures, presented in more detail in Tables 3-14 and 3-15, reflects the historic emphasis on predator control in the West, combined with the readiness of contributors in the West to provide cooperative funds. The data highlight the variety of resources protected by APHIS ADC program activities.

APHIS ADC program operations, research and development, and associated service and cooperative funds provide some insight into the magnitude of public expenditures for wildlife damage control. Studies of the magnitude of wildlife damage, as well as studies of private expenditures in agricultural sectors in specific States (Jahnke et al 1987, Scrivner and Connor 1984) suggest that costs to private farmers and livestock producers as well as costs to other private citizens who experience nuisance events and damage to personal property are considerable.

Table 3-13

APHIS ADC Federally Appropriated and Cooperative Fund Expenditures for Wildlife Damage Control Activities[a] (FY 1988)

	Federally Appropriated Funds			*Cooperative Funds*			
Region	Salary-Fringe	Other	Total	Salary-Fringe	Other	Total	Grand Total
Northeast	$679,263	$237,074	$917,057	$156,600	$128,457	$286,557	$1,203,614
Southeast	622,546	220,948	843,494	19,798	24,023	43,821	887,315
Great Lakes	285,396	94,965	380,361	31,285	8,255	41,316	421,677
Midwest	308,587	58,636	367,198	27,000	13,000	40,000	407,198
North Great Plains	520,445	550,173	1,070,618	592,556	474,638	1,067,194	2,137,812
South Great Plains	335,228	271,052	604,780	371,044	108,243	479,287	1,084,067
Texas	1,132,964	771,115	1,904,079	2,568,248	890,502	3,458,750	5,362,829
Intermountain	3,591,884	1,831,880	5,423,764	1,765,742	1,478,244	3,243,986	8,667,750
West Coast	1,614,116	1,055,798	2,797,414	2,012,025	990,616	3,130,141	5,927,555
Total	$9,090,429	$5,091,641	$14,308,765	$7,544,298	$4,115,978	$11,791,052	$26,099,817

Source: USDA 1987-88.

[a] In some cases, row totals include recorded expenditures not included as "federally appropriated" or "cooperative" funds in APHIS ADC Annual Reports (USDA 1987-88). As a result, totals may not match comparable values in Table 2-3.

2. Government's Role

Governmental participation in preventing and controlling damage caused by wildlife is sensible, given that wildlife belong in common to the country's citizens. Public ownership implies a responsibility to respond when wildlife threaten or harm the property of others, whether that property be crops, livestock, or human health and safety. For example, raccoons that introduce rabies to a previously unaffected locality may cause not only increased veterinary expenditures for pet owners but also greater health risks for the population in general. The public sector has a responsibility to act in such instances.

In addition, public sector involvement in animal damage control is economically justified by the frequently uncompensated interdependence of affected parties. Consequences not appropriately compensated though private sector mechanisms (that is, external benefits or costs) constitute economic inefficiencies for society. Deer feeding on one farmer's crops are successfully scared away, only to then feed at a neighboring farm, at a cost "external" to the first party's actions. Most economic activities in the world create external effects, in which case the public sector may have a role to play if economic efficiency is desired. Moreover, public sector involvement ensures that animal damage control is carried out humanely and with minimum adverse environmental impacts.

A combination of private and public actions is a logical approach to solving many animal damage problems, with the sharing of control and prevention costs matching, in theory, expected private and public benefits of the activities conducted. From this

Table 3-14

APHIS ADC Federally Appropriated Expenditures by Types of Resources Protected[a] (FY 1988)

	Wildlife	Health & Safety	Livestock	Crops	Forest & Range	Residential & Industrial	Total
Northeast	$46,100	$170,711	$174,314	$220,875	$52,638	$252,419	$917,057
Southeast	51,846	183,691	182,356	197,455	49,816	122,311	843,494
Great Lakes	41,506	29,016	106,971	98,397		29,068	380,361
Midwest	4,554	58,389	44,253	91,778	6,071	141,514	367,198
North Great Plains	5,343	26,553	532,001	390,180	103,226	13,315	1,070,618
South Great Plains		36,160	370,662	141,902	8,925	47,131	604,780
Texas		66,204	1,410,618	394,421	22,226	10,610	1,904,079
Intermountain	52,519	47,788	5,044,244	186,691	60,753	31,769	5,423,764
West Coast	42,308	175,960	1,741,750	296,597	144,563	222,948	2,797,414
Total	$244,176	$794,472	$9,607,169	$2,018,278	$448,218	$871,085	$14,308,765

Source: USDA 1987-88.
[a] In some cases, row totals include recorded expenditures not included as "federally appropriated" or "cooperative" funds in APHIS ADC Annual Reports (USDA 1987-1988). As a result, totals may not match comparable values in Table 2-3.

Table 3-15

APHIS ADC Cooperative Fund Expenditures by Types of Resources Protected[a] (FY 1988)

	Wildlife	Health & Safety	Livestock	Crops	Forest & Range	Residential & Industrial	Total
Northeast	$28,333	$160,520	$38,960	$12,995	$33,620	$12,129	$286,557
Southeast	30,000	525			13,296		43,821
Great Lakes	15,744			9,504			41,316
Midwest			39,600	400			41,316
North Great Plains	31,746	25,341	757,592	120,743	113,779	17,943	1,067,194
South Great Plains		14,774	305,827	68,910	27,039	62,737	479,287
Texas		110,174	2,550,852	280,528	186,674	330,522	3,458,750
Intermountain	142,269	7,181	3,031,286	23,494	37,386	2,370	3,243,986
West Coast	66,289	171,351	1,983,368	340,647	68,406	293,080	3,130,141
Total	$314,381	$489,866	$8,706,485	$857,221	$480,200	$718,781	$11,791,052

Source: USDA 1987-88.
[a] In some cases, row totals include recorded expenditures not included as "federally appropriated" or "cooperative" funds in APHIS ADC Annual Reports (USDA 1987-1988). As a result, totals may not match comparable values in Table 2-3.

perspective, a rancher may assume a significant share of costs in controlling predation by coyotes, since it is his flock of sheep most directly affected. On the other hand, a program to control the harassment of piping plovers, a threatened species, by seagulls should be entirely publicly funded, given that the plovers are a "public good," and the public-at-large would bear the loss of not controlling the harassment.

As trustee of the Nation's wildlife, and in order to minimize social economic costs, the government has a clear role to play in animal damage control. In general, incidents of damage caused by wildlife are appropriately addressed through coordinated actions of the public and directly affected parties.

3. Economic Magnitude of Wildlife Damage Control Activities

Information on the value of production is presented in this EIS for representative agricultural crop and livestock resources. The resources selected for inclusion were chosen because they have a relatively high national economic value and are subject to the various types of damage attributable to mammals and birds. These resources also are the basis for the majority of requests for APHIS ADC program technical assistance and direct control activities.

a. Value of Potentially Affected Resources

Historically, Federal and State efforts to control wildlife damage have largely focused on protecting agricultural resources. Currently, the largest number of requests for help from the APHIS ADC program come from operators of farms, ranches, and other agricultural enterprises (Table 3-12). Wildlife damage affects several other kinds of resources. These include other wildlife species, private properties, industrial facilities, transportation and communication systems, and human health and safety. Protection of such nonagricultural resources is receiving increased emphasis by APHIS ADC.

The total production of selected livestock, aquaculture, field crops, and timberland is summarized regionally in Tables 3-16 and 3-17. Figure 3-18 indicates the regions, which are modifications of the commonly used USDA regions. These regions are the most useful for interpreting the results of a national survey of some 20,000 farms conducted by the National Agricultural Statistics Service (NASS 1989). The survey assessed the types, levels, and sources of wildlife damage.

As Tables 3-16 and 3-17 illustrate, many agricultural resources are produced that could be damaged by wildlife. The total value of these resources is substantial within each commodity sector. There are variations in sizes and types of agricultural operations, geographic distribution of resources and production, agricultural methods, markets, and profitability of operations. For example, the methods and profitability of livestock operations in the United States differ substantially from place to place.

The 1987 production value information (Tables 3-18 through 3-20) indicates the amount of production for selected resources by State, providing a frame of reference for the economic loss information presented in the following section. Although this information provides a sense of where economic losses potentially may be high, damage is unlikely to be uniform throughout all production areas. Losses to individual producers may be high regardless of the volume of production in the area. For example, a sheep producer in the Northeast, where sheep production is generally low, may lose a large portion of his flock to predation, or an individual producer of corn outside of major production areas may suffer substantial losses due to blackbird depredation. These losses may not be reflected in nationwide or State production figures but may represent significant losses to those individual producers.

Figure 3-18 Geographic Regions of Analysis for Economic Impact Assessment

Table 3-16

Value of Production for Selected Livestock and Aquaculture, By Region of the United States [a,b] 1987

Region	Sheep & Lamb (1,000's dollars)	Cattle & Calves[b] (1,000's dollars)	Chickens (broiler) (1,000's dollars)	Turkeys (1,000's dollars)	Swine (1,000's dollars)	Catfish[c] (1,000's dollars)
Northeast	21,942	1,491,898	1,054,342	204,460	729,686	1,609
Southeast	1,274	2,366,986	3,561,207	489,853	1,503,859	222,563
Great Lakes	22,986	1,863,906	55,664	307,118	2,337,948	
Midwest	50,181	3,314,313	432,533	305,127	10,674,542	2,180
North Great Plains	58,437	3,826,490	1,831	41,185	1,158,098	
South Great Plains	16,512	3,189,417	105,096	1,390	618,806	9,925
Texas	79,099	3,394,131	337,218		109,160	3,313
Intermountain	145,825	3,098,795		37,922	154,753	
West Coast	102,849	2,073,324	403,303	192,607	154,627	5,774
Total	499,105	24,629,260	5,951,194	1,579,622	17,441,479	245,364

[a] Livestock and catfish numbers are from 1987. Livestock numbers reported in Crop Production, 1988 Summary (USDA 1989); catfish numbers reported in "Catfish Production, Results of Growers Survey 1988" (USDA 1988a).
[b] Figures do not include dairy stock.
c Total sales, all sizes.

Table 3-17

Value of Production for Selected Field Crops and Timberland, By Region of the United States[a] 1987

Region	Hay (1,000's dollars)	Corn (1,000's dollars)	Soybeans (1,000's dollars)	Wheat (1,000's dollars)	Timberland[b] (1,000's acres)
Northeast	1,626,351	687,180	313,292	124,696	107,448
Southeast	690,435	520,332	1,452,432	298,364	150,876
Great Lakes	1,194,168	1,860,855	1,295,474	317,848	45,662
Midwest	1,334,200	5,364,808	6,170,626	445,733	28,922
North Great Plains	717,413	1,811,253	730,733	1,224,628	2,320
South Great Plains	622,179	267,164	379,279	1,196,640	5,955
Texas	519,415	274,188	22,680	236,880	12,414
Intermountain	1,183,537	239,867		932,034	53,820
West Coast	1,207,648	104,043		594,310	75,896
Total	9,098,346	11,129,690	10,364,516	5,371,133	483,313

[a] Field crop numbers are from 1987 and are reported in Crop Production, 1988 Summary (USDA 1989); timberland numbers are reported in U.S. Forest Facts, Pamphlet PA-1384 (USDA 1988d).
[b] Numbers represent acreage in 1987; values are variable.

Economic information for the following agricultural resources is presented:

- Field and Forest Crops
  - Field Crops (alfalfa, corn, rice, soybeans, sunflowers, wheat)
  - Fruits and Nuts (apples, cherries, grapes, pecans)
  - Commercial Forests/Forest Products (trees/timberland)
- Aquaculture and Mariculture
  - Freshwater (catfish)
- Livestock
  - Sheep and Lambs
  - Cattle and Calves
  - Poultry
  - Goats
  - Swine

Table 3-18

Value of Production for Selected Livestock and Aquaculture Reported by State in 1987[a]

State	Sheep & Lambs (1,000's dollars)	Cattle & Calves[b] (1,000's dollars)	Chickens (Broiler) (1,000's dollars)	Turkeys (1,000's dollars)	Mohair Goats (1,000's dollars)	Swine (1,000's dollars)	Catfish[c] (1,000's dollars)
Alabama		371,810	737,858			63,877	14,224
Alaska	17	1,835				150	
Arizona	6,029	355,762				54,480	
Arkansas		383,962	1,107,003	118,080		216,522	19,521
California	69,190	1,082,497	341,053	180,081		54,545	5,774
Colorado	30,721	1,120,285				71,795	
Connecticut	549	10,989		620		1,629	
Delaware		4,514	319,972	1,596[d]		25,925	
Florida		296,959	127,099			50,152	1,575
Georgia		228,690	835,729	22,231		396,530	1,280
Hawaii		28,649	4,927			11,391	
Idaho	20,711	452,569				27,384	
Illinois	5,585	508,263		5,752		2,141,942	941
Indiana	4,034	239,978		94,757		1,605,680	
Iowa	23,003	1,379,344	6,318	67,830		5,390,050	
Kansas	12,803	1,967,209		1,390		575,753	754
Kentucky	1,605	432,695	3,282			344,995	1,609
Louisiana	483	188,031				16,344	5,752
Maine	903	16,100				3,832	

(Continued)

Table 3-18 (Continued)

Value of Production for Selected Livestock and Aquaculture Reported by State in 1987[a]

State	Sheep & Lambs (1,000's dollars)	Cattle & Calves[b] (1,000's dollars)	Chickens (Broiler) (1,000's dollars)	Turkeys (1,000's dollars)	Mohair Goats (1,000's dollars)	Swine (1,000's dollars)	Catfish[c] (1,000's dollars)
Maryland	957	60,472	354,551	1,596[d]		77,185	
Massachusetts	675	8,044		2,772		8,963	
Michigan	5,894	247,245	842	28,620		434,290	
Minnesota	12,385	829,144	37,913	228,096		1,614,991	
Mississippi		212,625				88,264	178,474
Missouri	5,492	833,386	415,336	108,500		1,139,650	1,239
Montana	22,689	560,320				38,468	
Nebraska	8,880	2,212,496	1,831	12,724		760,176	
Nevada	4,027	102,743				2,380	
New Hampshire	616	9,066		515		1,367	
New Jersey	633	11,744		2,576		2,271	
New Mexico	13,243	362,553				5,917	
New York	1,960	131,026	2,835	3,304		20,352	
North Carolina	417	159,638	582,316	312,341		468,315	274
North Dakota	8,860	496,883		7,020		52,688	
Ohio	12,067	353,342	10,879	28,288		397,220	
Oklahoma	3,709	1,222,208	105,096			43,053	9,171
Oregon	23,875	288,987	22,372	12,526		24,793	
Pennsylvania	3,911	333,226	140,843	67,200		148,925	
Rhode Island		769				566	
South Carolina		116,887	72,134	37,201		67,643	53
South Dakota	40,697	1,117,111		21,441		345,234	
Tennessee	374	408,384	99,068			136,212	1,410
Texas	79,099	3,394,131	337,218		42,606	109,160	3,313
Utah	23,591	185,814		37,922		3,683	
Vermont	745	39,331				1,499	
Virginia	5,952	386,717	201,941	110,889		83,662	
Washington	3,738	325,594	34,951			9,268	
West Virginia	3,436	47,205	30,918	13,392		8,515	
Wisconsin	4,707	787,517	16,909	50,402		288,667	
Wyoming	30,843	314,511				5,126	
Total	99,105	24,629,260	5,951,194	1,579,622	42,606	17,441,479	245,364

[a] Livestock and catfish values from 1987. Livestock values reported in *Crop Production, 1988 Summary* (USDA 1989) catfish values reported in "Catfish Production, Results of Growers Survey 1988" (USDA 1988a).

[b] Figures do not include dairy stock.

[c] Total sales, all sizes.

[d] Value of production reported for Delaware and Maryland combined.

Table 3-19

Value of Production for Selected Fruit and Nut Crops Reported by State in 1987[a]

State	Apples[b] (1,000's dollars)	Cherries[b] (1,000's dollars)	Grapes[b] (1,000's dollars)	Pecans[b] (1,000's dollars)
Alabama				9,500
Alaska				
Arizona			31,310	
Arkansas	476		1,345	798
California	72,150	28,440	1,206,940	
Colorado	8,375	253		
Connecticut	9,405			
Delaware	2,756			
Florida				3,746
Georgia	5,650		2,349	62,100
Hawaii				
Idaho	15,198	15,561		
Illinois	12,257			
Indiana	1,224			
Iowa	2,030			
Kansas	1,764			
Kentucky	3,213			
Louisiana				7,581
Maine	14,325			
Maryland	4,120			
Massachusetts	19,776			
Michigan	79,800	33,007	15,600	
Minnesota	5,980			
Mississippi				6,324
Missouri	5,247		965	
Montana		3,333		
Nebraska				
Nevada				
New Hampshire	11,200			
New Jersey	9,920			
New Mexico	1,966			16,250
New York	80,960	4,584	40,584	
North Carolina	24,960		648	1,140
North Dakota	23,700			
Ohio	23,700		2,160	
Oklahoma				4,968
Oregon	11,340	33,940		

(Continued)

Table 3-19 (Continued)

Value of Production for Selected Fruit and Nut Crops Reported by State in 1987[a]

State	Apples[b] (1,000's dollars)	Cherries[b] (1,000's dollars)	Grapes[b] (1,000's dollars)	Pecans[b] (1,000's dollars)
Pennsylvania	41,400	1,708	14,688	
Rhode Island	1,165			
South Carolina	3,780		241	2,047
South Dakota				
Tennessee	2,010			
Texas				24,612
Utah	5,032	3,325		
Vermont	7,920			
Virginia	44,733			
Washington	326,400	68,302	56,138	
West Virginia	13,500			
Wisconsin	10,075	840		
Wyoming				
Total	907,507	193,293	1,385,972	139,066

[a] Fruit and nut crop values from 1987 and are reported in *Crop Production, 1988 Summary* (USDA 1989).

[b] Values reported are for all varieties combined.

Table 3-20

Value of Production for Selected Field Crops and Timberland Reported by State in 1987[a]

State	Hay (1000's dollars)	Corn (1000's dollars)	Rice[b] (1000's dollars)	Soybeans (1000's dollars)	Sunflowers (1000's dollars)	Wheat (1000's dollars)	Timberland[c] (1000's acres)
Alabama	92,610	32,400		42,768		13,175	21,659
Alaska							15,763
Arizona	114,789	4,600				24,153	3,789
Arkansas	92,880	12,334	198,941	398,475		86,100	16,673
California	720,400	64,125	88,172			118,019	16,712
Colorado	250,728	192,510				238,763	11,739
Connecticut	19,104						1,777
Delaware	5,148	21,068		22,842		4,939	388
Florida	63,042	13,986		12,904		4,680	15,238
Georgia	81,840	107,604		83,460		34,937	23,383
Hawaii							700
Idaho	231,905	13,650				216,750	14,533
Illinois	185,387	2,102,100		1,776,500		145,730	4,030

(Continued)

Table 3-20

Value of Production for Selected Field Crops and Timberland Reported by State in 1987[a]

State	Hay (1000's dollars)	Corn (1000's dollars)	Rice[b] (1000's dollars)	Soybeans (1000's dollars)	Sunflowers (1000's dollars)	Wheat (1000's dollars)	Timberland[c] (1000's acres)
Indiana	134,940	137,240		926,500		88,740	4,296
Iowa	294,653	2,090,400		1,838,528		2,622	1,459
Kansas	344,160	254,880		351,104		879,120	1,207
Kentucky	286,626	225,264		132,000		40,425	11,908
Louisiana	42,856	41,375	78,101	208,680		14,756	13,873
Maine	28,248						17,175
Maryland	61,632	69,966		49,815		19,808	2,461
Massachusetts	26,481						3,010
Michigan	249,888	314,925		202,195		50,880	17,364
Minnesota	491,400	984,250		1,033,695	9,284	257,391	13,571
Mississippi	71,250	31,080	41,806	269,929		37,800	16,673
Missouri	367,591	400,868	12,259	819,168		90,321	11,996
Montana	208,395	3,465				407,433	14,736
Nebraska	262,238	1,380,740		424,580		201,630	536
Nevada	109,710					3,718	221
New Hampshire	16,471						4,803
New Jersey	29,561	20,900		16,112		3,159	1,914
New Mexico	119,349	14,431				23,936	5,181
New York	384,637	102,842				9,400	15,799
North Carolina	67,518	138,000		185,490		44,198	18,359
North Dakota	182,210	76,725		80,278	150,717	754,964	337
Ohio	351,629	634,200		809,930		118,320	7,141
Oklahoma	278,019	12,284		28,175		317,520	4,748
Oregon	220,022	8,118				143,055	22,084
Pennsylvania	452,226	205,110		29,733		21,081	16,186
Rhode Island	1,957						368
South Carolina	30,375	51,188		92,601		26,125	12,179
South Dakota	272,965	353,788		225,875	26,052	268,034	1,447
Tennessee	148,064	92,365		158,125		36,593	12,839
Texas	519,415	274,188	76,226	22,680	1,350	236,880	12,414
Utah	150,281	6,160				20,333	3,078
Vermont	66,378						4,424
Virginia	193,230	35,910		62,790		24,671	15,436
Washington	152,437	27,200				309,083	16,848
West Virginia	57,652	6,120				1,213	11,799
Wisconsin	452,880	561,680		59,584		9,577	14,727
Wyoming	113,169	9,651				21,101	4,332
Total	9,098,346	11,129,690	195,505	10,364,516	187,403	5,371,133	483,313

[a] Field crop values are from 1987 and are reported in *Crop Production, 1988 Summary* (USDA 1989); timberland acres are reported in U.S. Forest Facts, Phamphlet PA-1384 (USDA 1988d).

[b] 1986 production values.

[c] Numbers represent acreage in 1987; values are variable.

Figures 3-19 through 3-29 present maps that show the major production areas, by State, for the selected major agricultural resources listed previously. The major producing States are shaded, and States in which the ADC program responded to requests for assistance (i.e., technical assistance or direct control) are indicated. The ADC program has responded only to requests for assistance, and those requests have represented only a portion of the wildlife damage to the total agricultural resources (see "APHIS ADC Decision Model," Chapter 2, p. 2-23). For example, the alfalfa production map (Figure 3-19) shows 24 States with 1988 production over 1 million tons. The ADC program was asked to respond to wildlife damage to alfalfa in only eight of those States, and in an additional two States where alfalfa was not produced in excess of 1 million tons. Within those 10 States, ADC was asked to provide direct control or technical assistance for only a portion of the wildlife damage to alfalfa.

Nonagricultural resources are also at risk. For example, the analysis of a recent bird strike at John F. Kennedy International Airport resulted in over $250,000 damage to a single plane and risked the lives of over 300 people (Dolbeer 1991). Similarly, many industrial facilities, elements of transportation and communication systems, and urban structures may be at risk of wildlife damage.

The total value of nonagricultural resources affected by the ADC program is not presented in this EIS, because a value can not be made for human health and safety or the information either generally is not available or would not be useful for comparison with loss information presented in the following section.

b. Damage and Losses

(1) Agricultural and Nonagricultural Losses

Many wildlife species take advantage of various agricultural and nonagricultural human activities. Crops and livestock can represent an important supplemental food source for wildlife. Crop and livestock depredation by wildlife subjects the producer to economic losses of varying degree, depending on the season, the stage of development of the crop or livestock, and the vulnerability of the crop or livestock to depredation.

Agricultural losses attributable to wildlife may occur from activities other than feeding. Trampling of crops, burrowing and digging in fields, habitat modification through flooding, fecal contamination of livestock feed, and the spread of wildlife-borne disease represent some types of wildlife damage that may result in agricultural losses.

Nonagricultural losses attributable to wildlife also may occur. Buildings, bridges, dikes, telephone poles, underground cables, and a variety of other facilities and structures are subject to wildlife damage and the associated economic losses. Collisions between wildlife and automobiles or other vehicles (including aircraft) may involve loss of human life, expensive medical costs, and vehicle repairs.

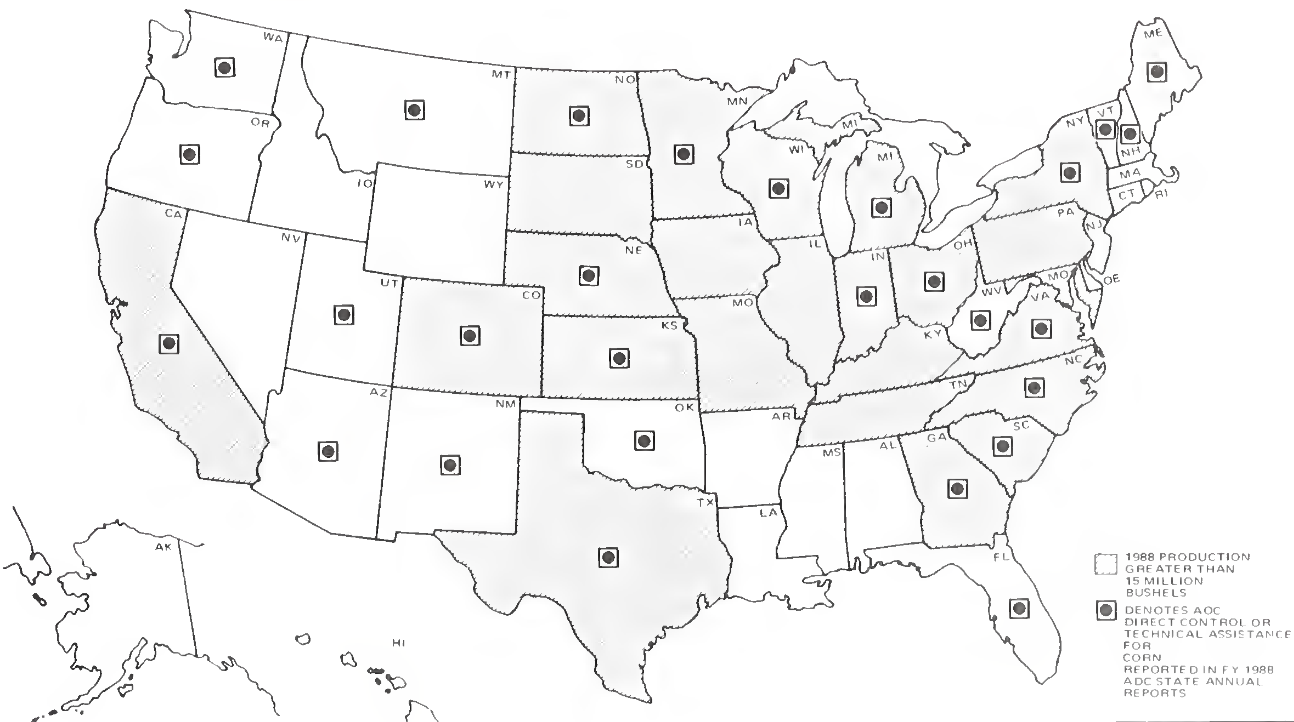
Determining the volume of wildlife-caused losses for agricultural resources is difficult. Discriminating between losses caused by injury, disease, weather, insects, and other causes and losses caused solely by wildlife complicates this determination. In some cases, poultry and livestock losses are unnoticed until harvest for marketing or other uses; on large ranches and farms, low levels of loss may not be noticed by the producer. In other cases, such as with aquacultural and maricultural resources, the amount of resource (e.g., fish, oysters, etc.) existing prior to wildlife depredations may be hard to define, making loss estimates less reliable.

This flooding resulted from rodent burrowing in the bank of an irrigation canal.

Figure 3-19 **Alfalfa Production in 1988[a]**

[a] Source: USDA 1989.

Figure 3-20 **Corn Production in 1988[a]**

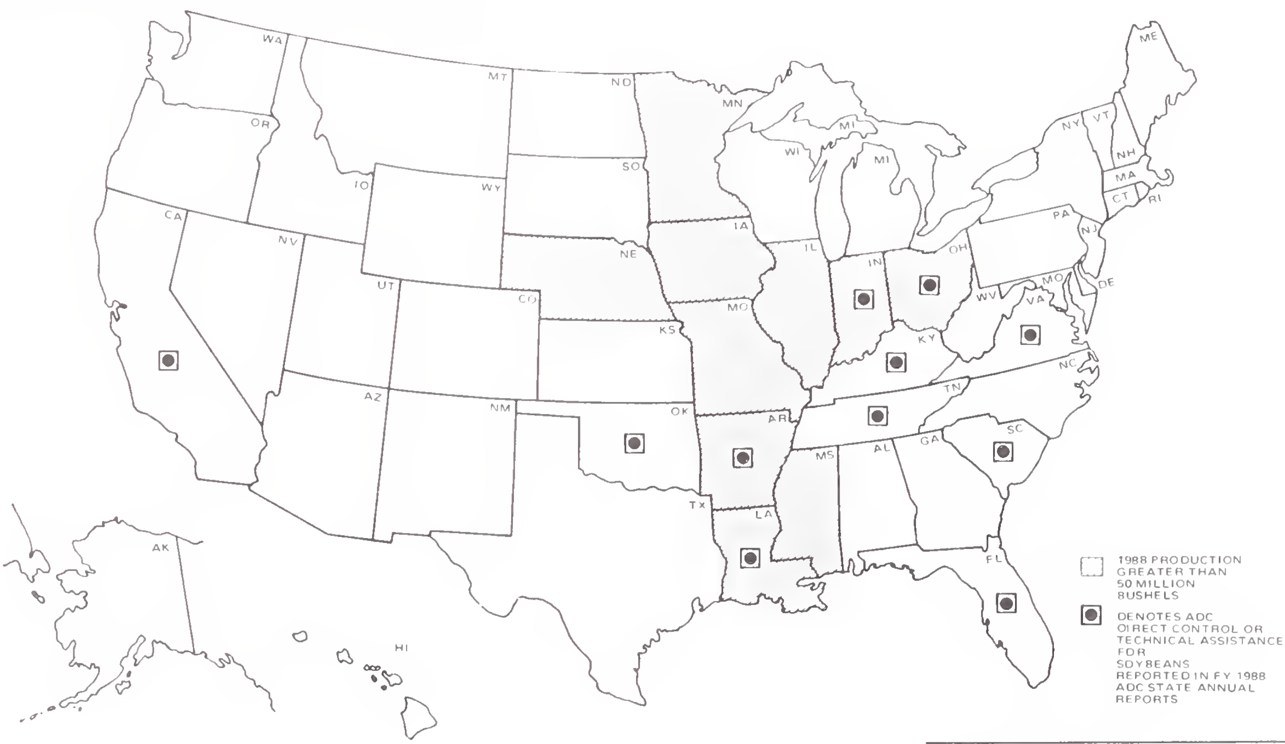


[a] Source: USDA 1989.

Figure 3-21 **Rice Production in 1988**[a]

[a] Source: USDA 1989.

Figure 3-22 **Soybean Production in 1988**[a]

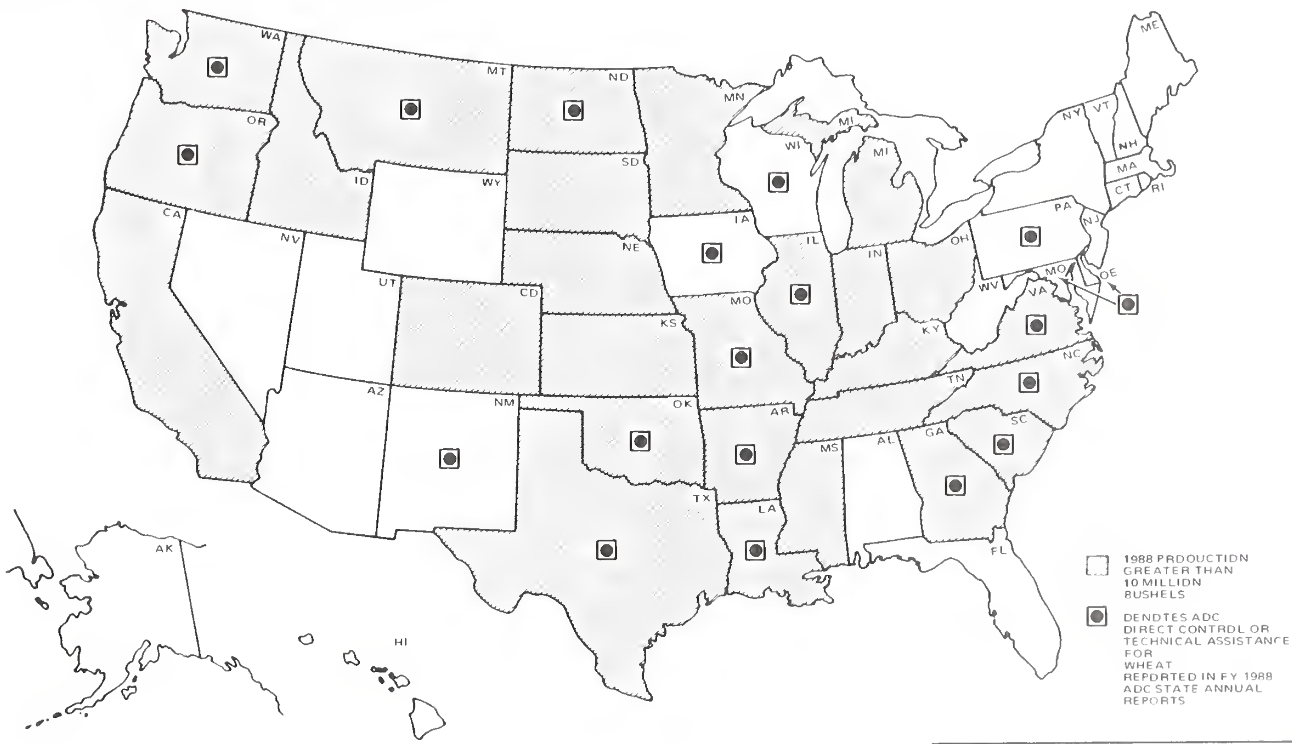


[a] Source: USDA 1989.

Figure 3-23 **Sunflower Production in 1988**[a]

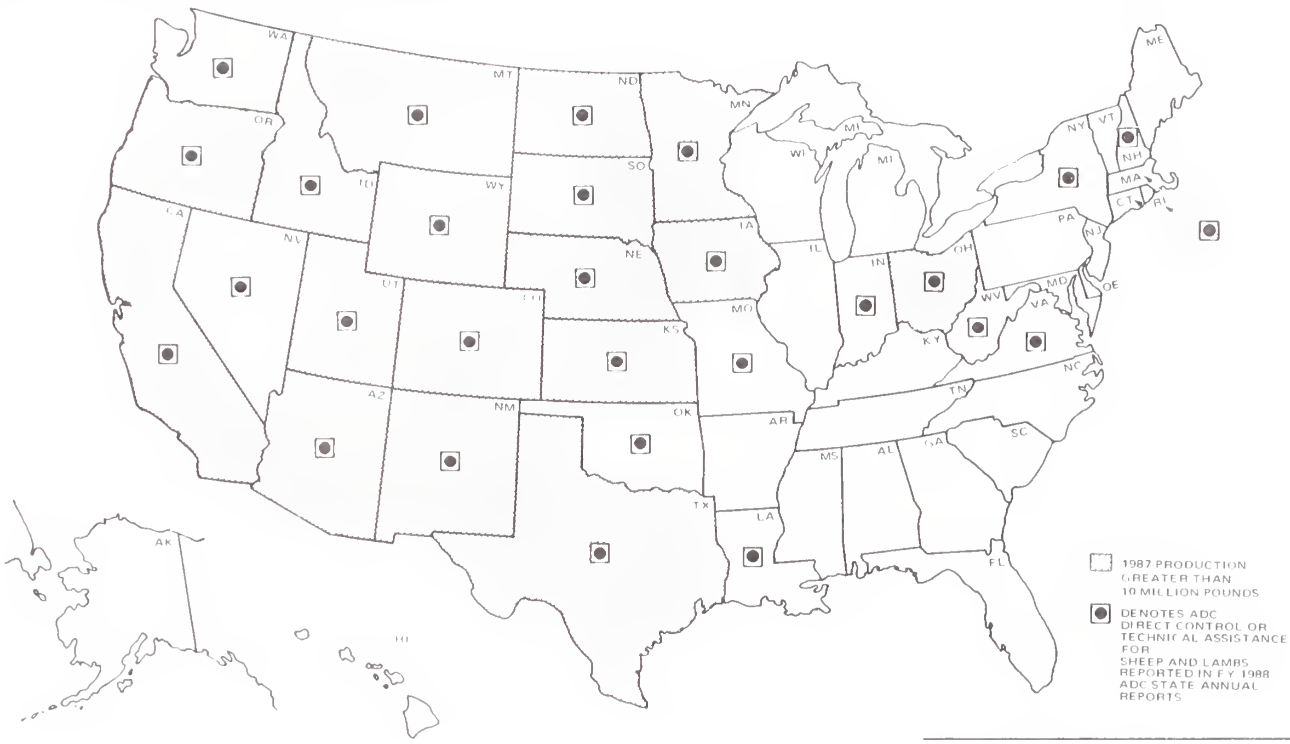
[a] Source: USDA 1989.

Figure 3-24 **Wheat Production in 1988**[a]



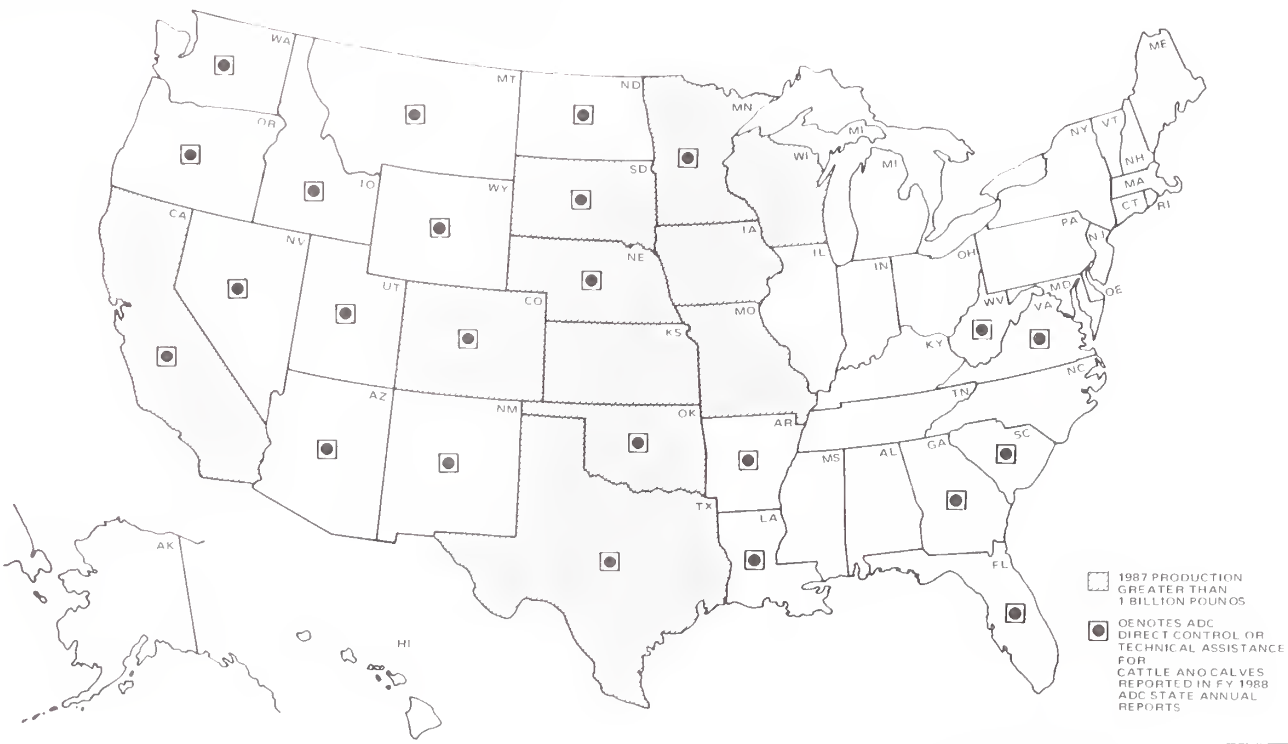
[a] Source: USDA 1989.

Figure 3-25 **Sheep and Lamb Production in 1987**[a]



[a] Source: USDA 1989.

Figure 3-26 **Cattle and Calf Production in 1987**[a]

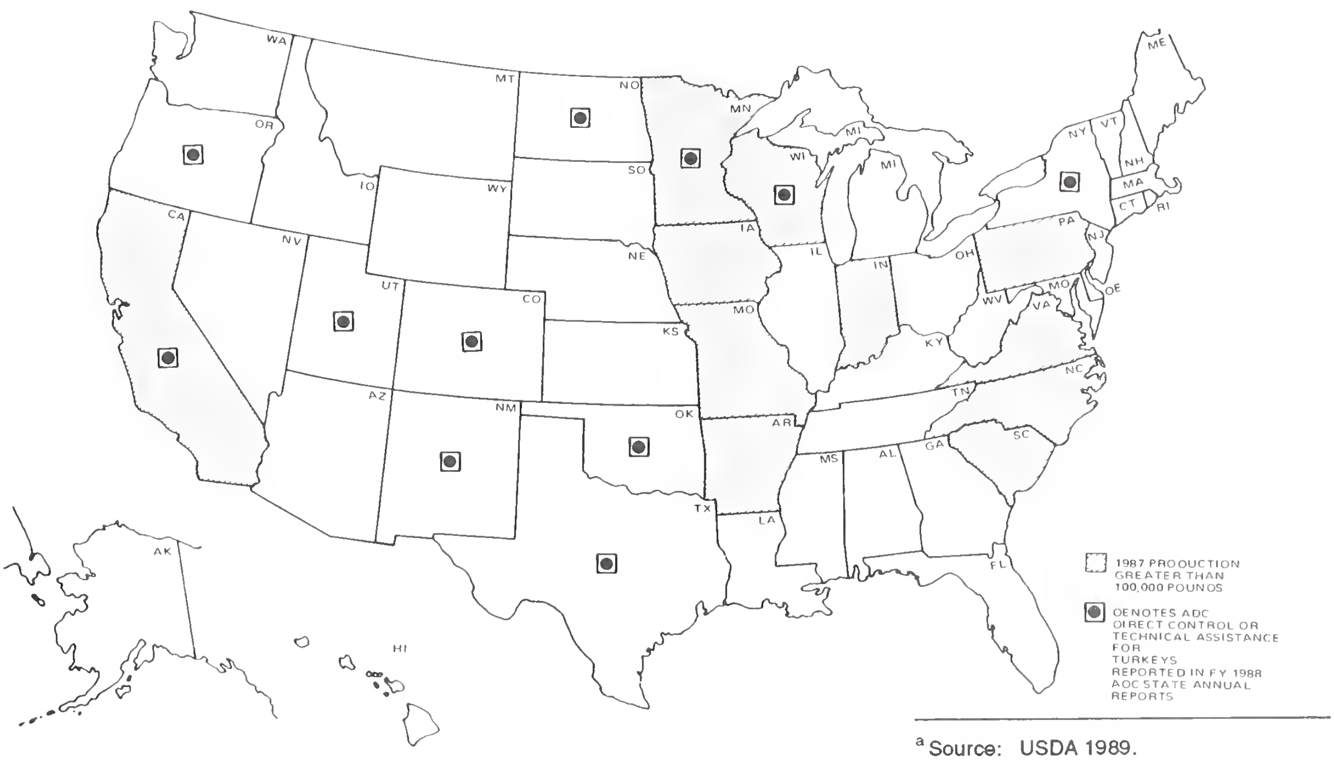


[a] Source: USDA 1989.

Figure 3-27 **Chicken Production in 1987[a]**

[a] Source: USDA 1989.

Figure 3-28 **Turkey Production in 1987[a]**



[a] Source: USDA 1989.

Figure 3-29 **Swine Production in 1987**[a]

[a] Source: USDA 1989.

c. Estimates of Losses

Estimates of crop and livestock losses are commonly determined by objective or subjective surveys. Objective surveys usually measure losses by sampling a random number of subject plots, fields, herds, or flocks. Besser (1985) reports that objective surveys provide the best and most usable source of information on crop damage by birds, because the reliability of the numbers obtained can be determined and the range of probable losses for any given degree of reliability can be established.

Subjective surveys rely on information provided by producers. Producers generally receive a questionnaire asking for information on what they believe or perceive their losses to be. Loss data obtained from subjective surveys sometimes are misleading because the survey may ask for information that the producer is ill prepared to provide, often does not know, or purposefully exaggerates (Besser 1985). However, these surveys are useful in determining the locations of the most serious losses and the species primarily responsible for the damage. Loss data for selected crops and livestock due to wildlife damage are presented in Tables 3-21 through 3-23.

ADC program personnel also compile selected data on wildlife damage, but data collection generally is limited to losses associated with direct control activities. These activities are directed primarily at livestock protection. The ADC program currently provides damage control assistance for only a portion of the crops and livestock affected by wildlife. Confirmed loss data are collected primarily to substantiate the occurrence of wildlife damage and the need for assistance as shown in Tables 3-24 and 3-25. These data do not represent total losses for entire States.

Survey loss estimates available in the literature and the confirmed loss values compiled by APHIS ADC program personnel in FY 1988 for selected agricultural resources protected by the APHIS ADC program are presented in Table 3-26. These data are presented primarily to demonstrate that the APHIS ADC confirmed loss data represent only a small portion of the total reported losses to the affected resources. Based on a survey of producers by NASS in 1989, greater than 2 percent of producers with wildlife-caused losses reported their loss to APHIS ADC (Wywialowski 1992). In most cases, the loss information taken from literature sources is for a different year than the APHIS ADC confirmed loss data. Nevertheless, a relative comparison of the difference between APHIS ADC confirmed losses and the losses reported in the literature may be made.

Each State may have different needs and objectives for compiling loss information. Currently, there is no nationwide standardized loss reporting system for the APHIS ADC program. However, in some instances, the only wildlife damage data reported for a particular resource within a State are the limited confirmed loss data compiled by APHIS ADC personnel. These data become important in evaluating the need for damage control.

The APHIS ADC confirmed loss data (Tables 3-24 and 3-25) document losses confirmed by APHIS ADC program personnel in response to requests for assistance in FY 1988. As noted, confirmed loss data are collected by APHIS ADC program personnel to substantiate the occurrence of wildlife damage and the need for assistance. Procedurally, APHIS ADC employees only document loss occurrence and do not attempt to measure total losses. Confirmed losses (shown in the Tables 3-24 and 3-25) are just a fraction of total loss. Consequently, these loss records do not document the full magnitude of the incidence of wildlife damage, even to agricultural resources.

Tables 3-27 through 3-30 present the results of a 1989 NASS survey of agricultural producers (Wywialowski 1994). Based on a random sample of 20,000 farms and ranches, the survey documented that over half of the farms in the United States reported wildlife damage during the 12-month period ending in July 1989. Carnivores, primarily coyotes, were most frequently cited by livestock producers and caused more losses in western regions (Tables 3-27 and 3-28). Hoffed mammals, primarily deer, were the main wildlife

Table 3-21

Statewide Estimates of the Value of Wildlife Damage to Selected Fruit and Nut Crops

State	Apples (1000's dollars)	Cherries (1000's dollars)	Grapes (1000's dollars)	Pecans (1000's dollars)	Year of Damage Reported	Species Responsible for Damage	Reference
California			3,700		1972	Birds	Crase *et al.* 1976
			3,000		1973	Birds	Dehaven 1974
Georgia	94			359	1986	Deer and Beaver	Nash 1987
Michigan		1,800-4,300			1972	Birds	Stone 1973a
Oklahoma				700	1977	Birds	Besser 1985
Wisconsin	200				1983/84	Deer	Wisconsin Agricultural Reporting Service 1984
Total	294	1,800-4,300	6,700	1,059			

group cited by field crop producers. Deer-caused losses of filed crops were greatest in the northeastern and northcentral United States with ≥ 41 percent of producers citing losses. Nationwide, 55 percent of all respondents believed they had wildlife-caused losses of their commodities. Based on the median value of producers' estimates of their losses, wildlife-caused losses cost producers $461 million in 1989. While these losses generally represent ≤ 0.3 percent of the value of agricultural production, the losses are not equitably distributed and some producers may sustain very high loss rates.

Another NASS study in 1991 (NASS 1991) indicated that approximately 490,000 sheep and lambs valued at $21.7 million were lost to predators in 1990. Approximately 64 percent of these losses were attributed to coyotes, 13.6 percent to dogs, and the remainder to mountain lions, bears, foxes, eagles, bobcats, and other animals. This survey also indicated losses of about 129,400 goats (Angora and other) valued at $5.7 million to coyotes, bobcats, eagles, dogs, and other predators in five States during 1990.

A third study, (NASS 1992), showed that predators, primarily coyotes and dogs, caused losses of 106,000 head of cattle and calves valued at $41.5 million during 1991 in the United States. These losses to predators comprised 2.4 percent of all cattle and calf death losses in 1991. The complete reports (NASS 1991, 1992) are included in Appendix M.

Estimates of the value of losses from predators vary considerably, depending on the regions studied, methods used, and years reported. However, despite this variation studies have found the total value of losses to be substantial. Studies of coyote damage illustrate this point. The General Accounting Office (GAO) estimated that coyotes in 17 western States killed sheep and lambs valued at $18 million in 1989 (GAO 1990). One recent tally of coyote damage found that about 104,000 sheep, lambs, goats, cattle, and other livestock with a value of about $9.9 million were reported to APHIS ADC program personnel as killed or injured by coyotes during FY 1990 (Connolly 1992a). Most of the reported losses occurred in the Western States. Total reported damage from coyotes to poultry and fowl, field crops, and other birds and mammals, as well as to property, public health and safety, and pets was about $10.5 million in 1990.

Table 3-22

Statewide Estimates of the Value of Wildlife Damage to Selected Livestock

State	Sheep & Lambs (1000's dollars)	Cattle & Calves (1000's dollars)	Chickens (1000's dollars)	Swine (1000's dollars)	Year of Damage Reported	Species Responsible for Damage	Reference
Colorado	1,873				1966	All predators	Colorado Crop and Livestock Reporting Service 1967
Idaho	1,371				1984	All predators	Idaho Crop and Livestock Reporting Service 1987b
	1,698				1985	All predators	Idaho Crop and Livestock Reporting Service 1987b
	1,775				1986	All predators	Idaho Crop and Livestock Reporting Service 1987b
	1,749				1987	All predators	Idaho Crop and Livestock Reporting Service 1987b
Montana	1,018				1967	All predators	Reynolds and Gustad 1971
	1,511				1968	All predators	Montana Crop and Livestock Reporting Service 1970
	1,375				1969	All predators	Montana Crop and Livestock Reporting Service 1970
Nebraska	384	1,401	365	193	1970/71[a]	All predators	Nebraska Dept. of Agriculture 1972
South Dakota	509	152	58	13	1970	All predators	South Dakota Crop and Livestock Reporting Service 1971
Texas	2,432				1967	All predators	Reynolds and Gustad 1971
Utah	4,730				1987	All predators	Utah Dept. of Agriculture 1988
Wyoming	1,682				1966	All predators	Reynolds and Gustad 1971
	1,326				1968	All predators	Wyoming Coop. Crop and Livestock Reporting Service 1970
	2,455				1969	All predators	Wyoming Coop. Crop and Livestock Reporting Service 1970
	3,374				1973	All predators	Wyoming Department of Agriculture 1975
	3,411				1974	All predators	Wyoming Department of Agriculture 1975
	3,114				1987	All predators	Wyoming Agricultural Stat. Service 1989
	2,468				1988	All predators	Wyoming Agricultural Stat. Service 1989
	4,016				1980	All predators	University of Wyoming Coop. Extension Service 1985
	2,980				1981	All predators	University of Wyoming Coop. Extension Service 1985
	2,473				1982	All predators	University of Wyoming Coop. Extension Service 1985
	2,583				1983	All predators	University of Wyoming Coop. Extension Service 1985
	3,736				1984	All predators	University of Wyoming Coop. Extension Service 1985
	4,035				1985	All predators	University of Wyoming Coop. Extension Service 1985
Total	58,078						

[a] Data reported for October 1970 through September 1971.

Table 3-23

Statewide Estimates of the Value of Wildlife Damage to Selected Field Crops and Timberland

State	Corn (1000's dollars)	Rice (1000's dollars)	Soy-bean (1000's dollars)	Sun-flower (1000's dollars)	Wheat (1000's dollars)	Timber-land (1000's acres)	Year of Damage Reported	Species Responsible for Damage	Reference
Alabama	63						1970	Birds	Stone et al. 1972
Arkansas	139	4,218			351		1963	Birds	Pierce 1970
	98	2,826			654		1966	Birds	Pierce 1970
	9	3,049			198		1968	Birds	Pierce 1970
California		75					1970	Birds	DeHaven 1971
						212	1988	Mammals	CA Forest Pest Council 1988
Georgia			7,395				1987	Deer/Beaver	Nash 1987
	6 to 10						1971	Sandhill Crane	Stone and Mott 1973
	277						1970	Birds	Stone et al. 1972
Illinois	815						1970	Birds	Stone et al. 1972
Iowa	27						1970	Birds	Stone et al. 1972
	775						1981	Birds	Besser and Brady 1982
Kansas	156						1970	Birds	Stone et al. 1972
Kentucky	393						1970	Birds	Stone et al. 1972
	1,200						1977	Birds	Stickley et al. 1979
	430						1977	Mammals	Stickley et al. 1979
Maryland	185						1970	Birds	Stone et al. 1972
Michigan	727						1970	Birds	Stone et al. 1972
Minnesota	617						1970	Birds	Stone et al. 1972
				1,200			1979	Birds	Hothem et al. 1988
				800			1980	Birds	Hothem et al. 1988
Mississippi	158						1970	Birds	Stone et al. 1972
Missouri	49						1970	Birds	Stone et al. 1972
Nebraska	103						1970	Birds	Stone et al. 1972
New York	493						1970	Birds	Stone et al. 1972
North Carolina	86						1970	Birds	Stone et al. 1972
North Dakota				300			1972	Birds	Henne et al. 1979
				2,700			1978	Birds	Henne et al. 1979
				3,600			1979	Birds	Hothem et al. 1988
				6,500			1980	Birds	Hothem et al. 1988
				7,400			1980	Birds	DeHaven 1982
Ohio	986						1970	Birds	Stone et al. 1972
	3,900						1977	Blackbirds	Kelly et al. 1982
	930						1977	Mammals	Kelly et al. 1982
	5,900						1978	Blackbirds	Kelly et al. 1982
	750						1978	Mammals	Kelly et al. 1982

(Continued)

Table 3-23

Statewide Estimates of the Value of Wildlife Damage to Selected Field Crops and Timberland

State	Corn (1000's dollars)	Rice (1000's dollars)	Soy-bean (1000's dollars)	Sun-flower (1000's dollars)	Wheat (1000's dollars)	Timber-land (1000's acres)	Year of Damage Reported	Species Responsible for Damage	Reference
Ohio (continued)									
	1,240						1979	Mammals	Kelly et al. 1982
	3,880						1977	Birds	Stickley et al. 1979
	930						1977	Mammals	Stickley et al. 1979
	3,703						1983	Blackbirds	Butler 1983
	8,979						1983	Mammals	Butler 1983
	3,800						1977	Blackbirds	Dolbeer 1980
	5,900						1978	Blackbirds	Dolbeer 1980
	6,780						1979	Blackbirds	Dolbeer 1980
Pennsylvania	1,267						1970	Birds	Stone et al. 1972
South Carolina	45						1970	Birds	Stone et al. 1972
South Dakota	304						1970	Birds	Stone et al. 1972
				400			1979	Birds	Hothem et al. 1988
				600			1980	Birds	Hothem et al. 1988
Tennessee	108						1970	Birds	Stone et al. 1972
	380						1977	Birds	Stickley et al. 1979
	160						1977	Mammals	Stickley et al. 1979
Texas	20						1970	Birds	Stone et al. 1972
Virginia	205						1970	Birds	Stone et al. 1972
	484						1971	Birds	Stone and Mott 1973
Wisconsin	20,600		1,500				1983/84[a]	Deer	WI Agricultural Reporting Service 1984
	770						1970	Birds	Stone et al. 1972
Total	85,631	10,168	8,895	23,500	1,203	212			

[a] Data reported for October 1983 through September 1984.

3 Affected Environment

Table 3-24

Dollar Value of Confirmed Losses[a] Reported in FY 1988 by APHIS ADC Personnel for Selected Field Crops, Timberland, and Fruits and Nuts[b]

State[c]	Alfalfa	Corn	Rice	Soy-beans	Sun-flower	Wheat	Timber-land	Apples	Cherries	Grapes	Pecans
Arizona		70,175						300			90,000
California	140,701	2,962		1,200			24,112	24,235	130	3,780	
Colorado		1,220									
Idaho										20,000	
Montana						500					
New Hampshire		6,967									
New Mexico	76,618	12,426				4,340		7,595	550	510	9,760
North Dakota		232			2,480,940		72,330				
Oklahoma	2,375	255		200		150					
Oregon	21,755	760				44,750	253,860		500	500	
South Dakota							29,435				
Texas	200	39,140	475,045		40	31,735	197,691	7,600			32,975
Utah	5,500	2,000									
Washington	3,616	23,568				33,953	3,159	11,737	12,922	800	
Total	250,765	159,705	475,045	1,400	2,480,940	115,428	580,587	51,467	14,102	25,590	132,735

[a] Confirmed losses (dollars) are those verified by APHIS ADC personnel only and are not necessarily indictive of the manitude of losses on a statewide basis.

[b] Source: FY 1988 APHIS ADC State annual reports.

[c] Only those States reporting confirmed losses in FY 1988 APHIS ADC State annual reports are included.

Table 3-25

Dollar Value of Confirmed Losses[a] Reported in FY 1988 by APHIS ADC Personnel for Selected Livestock[b]

State[c]	Sheep & Lambs	Cattle & Calves	Chickens	Turkeys	Mohair Goats	Swine
Arizona	51,725	176,825	452		7,400	230
California	297,441	75,138	29,223	10,863	7,165	
Colorado	157,903	4,550	65			
Idaho	72,450	2,847	21			13
Montana	148,420	31,050	403			210
Nebraska	20,044	23,488	5,112			376
Nevada	133,400	6,800	40			
New Mexico	52,248	81,795	762	10	12,980	1,225
North Dakota	42,916	14,579	3,848	1,934		810
Oklahoma	36,370	85,410	2,947	550	11,470	1,015
Oregon	61,895	53,835	708	24		140
South Dakota	95,534	30,100	8,094			1,890
Texas	133,490	75,845	3,826	1,046	114,585	2,105
Utah	200,764	14,225	125	1,344		
Washington	3,538	13,218	76			
Wyoming	122,350	7,200	36		25	
Total	1,412,604	689,705	55,702	15,771	153,600	8,014

[a] Confirmed losses (dollars) are those verified by APHIS ADC personnel only and are not necessarily indicative of the magnitude of losses on a statewide basis.

[b] Source: FY 1988 APHIS ADC State annual reports.

[c] Only those States reporting confirmed losses for livestock in FY 1988 APHIS ADC State annual reports are included.

Table 3-26

Comparison of Annual APHIS ADC Confirmed Losses Reported in FY 1988 APHIS ADC State Annual Reports and Annual Statewide Losses Reported for Selected Resources Protected by the APHIS ADC Program

State	APHIS ADC Confirmed Loss	Literature Reported Loss	Year of Damage Reported in Literature	Literature Reference
Grapes				
California	$3,780	$3,700,000	1972	Crase *et al.* 1976
Corn				
Texas	$39,140	$20,000	1970	Stone *et al.* 1972
Timber				
California	$24,112	211,740 acres[a]		California Forest Pest Council 1988
Sheep and Lambs				
Colorado	$157,903	$1,873,000	1966	Colorado Crop and Livestock Reporting Service 1967
Idaho	$72,450	$1,749,000	1987	Idaho Crop and Livestock Reporting Service 1988b
Montana	$148,420	$1,375,000	1969	Montana Crop and Livestock Reporting Service 1970
Nebraska	$20,044	$384,000	1970/71[b]	Nebraska Dept. of Agriculture 1972
South Dakota	$95,534	$509,000	1970	South Dakota Crop and Livestock Reporting Service 1971
Texas	$133,490	$2,432,000	1967	Reynolds and Gustad 1971
Utah	$200,764	$4,730,200	1987	Utah Dept. of Agriculture 1988
Wyoming	$122,350	$2,468,000	1988	Wyoming Agricultural Statistics Service 1989
Cattle and Calves				
Nebraska	$23,488	$1,401,000	1970/71[b]	Nebraska Dept. of Agriculture 1972
South Dakota	$30,100	$152,000	1970	South Dakota Crop and Livestock Reporting Service 1971
Swine (Hogs and Pigs)				
Nebraska	$376	$193,000	1970/71[b]	Nebraska Dept. of Agriculture 1972
South Dakota	$1,890	$13,000	1970	South Dakota Crop and Livestock Reporting Service 1971
Chickens				
Nebraska	$5,112	$365,000	1970/71[b]	Nebraska Dept. of Agriculture 1972
South Dakota	$8,094	$58,000	1970	South Dakota Crop and Livestock Reporting Service 1971
Total	$1,087,047	$21,633,940		

[a] Damage to timber was reported in acreage; value per acre is variable.

[b] Data reported for October 1970 through September 1971.

Most loss estimates, including those of NASS (1991, 1992), report only the direct costs of predation; that is, market value of the animals killed or damaged. However, the indirect costs of predation also are substantial. Indirect costs include the ranchers' own expenses as a result or prevention of predation. These include such items as intensified animal husbandry, guardian animals, and payments to predator control programs. Considering both direct and indirect costs, the reported economic impact of predation on sheep in 17 western States probably exceeds $50 million annually (Connolly 1992b).

Damage from wildlife affects more than agricultural resources (Wade 1987). Black bears, mountain lions, and occasionally coyotes can present physical hazards to humans. Raccoons and skunks can transmit rabies directly to humans or to domestic animals. The Center for Disease Control estimated that some 25,000 persons a year in the United States receive rabies prophylaxis after being bitten (Wade 1987). Rodents, such as beaver, nutria, and muskrats damage trees, shrubs, and landscaping in urban areas, as well as rural roads, dams, and levees. Bird roosts in urban and suburban areas can present public health hazards or cause damage to buildings, sidewalks, and shrubbery. Bird populations on or near airports may present major hazards to air traffic and passenger safety. Although comprehensive information is not available on such damage, the total costs exceed $11.5 billion (Conover 1993).

This discussion of the value of resources and wildlife damage suggests the following conclusions:

- A wide variety of agricultural and nonagricultural resources are potentially at risk from wildlife damage.
- Approaches to placing an economic value on these resources vary, as does the amount and quality of the information available.
- The incidence of wildlife damage is widespread, with damage occurring in every region of the United States.
- Comprehensive information on the total value of wildlife damage in the United States is not available. However, what is available shows that the value of losses resulting from wildlife damage is in excess of $12 billion (Conover 1993).

E. Sociocultural Environment

The sociocultural environment of wildlife damage management programs is complex. The issues addressed in this sociocultural assessment were derived primarily from those identified during scoping and Congressional testimony on APHIS ADC program policy changes and oversight and several U.S. House of Representatives and U.S. Senate bills proposed to amend the Animal Damage Control Act of 1931 (see Chapter 2). During the scoping process, the central sociocultural issues raised were concerns regarding animal welfare and the killing of wildlife and the effect of the program on the viability of the agricultural community. The following discussion characterizes these central concerns and other issues raised during scoping. In addition, relevant literature was used to complete the sociocultural assessment.

The primary social issues relative to managing wildlife damage are humaneness, effectiveness, and ecological soundness. Most of the American public is generally concerned with humane treatment of animals, that is, the minimization of pain or suffering in animals. Effectiveness is determined by how quickly, economically and completely the methods resolve the problem. Finally ecological soundness is a broad category which includes minimizing adverse impacts on wildlife or ecosystems that are affected by the program. Ecological effects are discussed under the Biological Impact Assessment section.

3 Affected Environment

The affected sociocultural environment includes the diverse values, lifestyles, and livelihoods of the American public. This includes all publics adversely affected by wildlife damage or concerned about wildlife damage control, particularly ranchers, farmers, ecological interest groups, humane interests, and animal rights activists. These interest groups are most active in seeking changes to wildlife damage management practices and programs. Wildlife provides many societal benefits and is publicly owned. Therefore, the resolution of wildlife-caused damage is a societal problem, because the costs of wildlife-caused damage frequently are not distributed the same as wildlife-based benefits. (See Heinrich and Craven (1992) for a specific example and discussion of this dilemma). Because APHIS ADC is directed to resolve such problems, interest groups opposed to some of the methods used to reduce damage often focus their opposition on the program rather than the specific methods or issues involved.

Although some individuals could be classified in many of the interest groups, the philosophical and political agendas of the groups differ dramatically. Just as the perspective of an individual is dynamic and may change as new information is acquired, societal values change over time. Chapter 1 provides a history of the Federal wildlife damage control program including significant program changes over time. Program changes have been consistent with the direction of shifts in societal values in the environmental arena. The program continues to respond to society's needs through changes in program methods, distribution, and emphasis (APHIS-ADC Strategic Plan 1989, Schmidt et al. 1992).

Key determinants in the general public's views on the Federal wildlife damage program are attitudes toward wildlife and the public's perception of program activities. Americans generally hold positive attitudes toward wildlife. Research conducted by Kellert and Berry (1980) identified several different attitudes toward domestic animals and wildlife, and an approximation of the percentage of society holding each attitude. Further analysis by Kellert and Berry (1987) showed that attitudes, knowledge and behaviors toward wildlife were strongly influenced by gender. Women scored higher on humanistic, moralistic, and negativistic attitudes toward wildlife; whereas men scored higher on utilitarian, dominionistic, naturalistic and ecologistic attitudes (Kellert and Berry 1987). "Women were far more bothered than men about the possible infliction of pain and suffering on individual animals" (Kellert and Berry 1987:369), and comprise 80% of humane and animal-welfare organizations. In contrast, men comprise 89% of sportsmen and 62% of environmental protection organizations (Kellert and Berry 1987).

With respect to the program, interest groups are likely to respond differently to wildlife damage control options. These interests can be grouped into four categories: ecological, animal welfare, animal rights, and recipients of the present program's services. Interest in program activities within these groups is high partly because of the large sector of American society included in these groups. For example, Silberman (1988) identified over 7,000 organizations in the humane movement in the United States.

1. Ecological Interest Groups

The ecological interest group's view favors the protection of natural ecosystems and, especially, threatened and endangered species. This view is held by many individuals in society, including wildlife managers. To appropriately manage wildlife, managers must understand the biological systems (ecosystems) in which they work and try to protect. Wildlife managers frequently develop strong ecological ethics and may represent segments of the environmental group which also have more scientific and utilitarian attitudes as discussed by Kellert and Berry (1987). Their ethics were perhaps best expressed by Aldo Leopold, who is widely considered to be the "Father of Wildlife Management":

Table 3-27

The Percentage of Livestock/Poultry Producers With Losses by Wildlife Groups

Region	Carnivores	Omnivores	Rodents/ Rabbits	Birds	Hoofed Mammals	Other Wildlife	Any Wildlife
West Coast	26.5	3.2	3.5	2.6	1.3	1.3	30.4
Intermountain West	26.2	5.3	4.1	2.2	4.1	1.0	31.3
Northern Great Plains	16.9	3.3	9.0	0.8	4.5	0.6	26.6
Southern Great Plains	15.1	2.1	1.8	1.5	2.2	1.1	19.8
Texas	25.7	1.5	0.9	3.1	1.5	1.6	28.5
Southeast	18.1	2.3	1.9	2.5	1.2	2.4	22.9
Midwest	11.4	1.8	1.4	1.5	1.9	0.6	15.2
Great Lakes	5.7	2.7	0.3	2.2	1.4	0.6	10.2
Northeast	10.0	2.2	2.3	1.7	2.1	0.7	16.0
Nationwide	15.6	2.4	2.2	2.0	2.0	1.2	20.4

Table 3-28

The Percentage of Field Crop Producers With Losses by Wildlife Groups

Region	Hoofed Mammals	Rodents/ Rabbits	Omnivores	Birds	Carnivores	Other Wildlife	Any Wildlife
West Coast	17.5	25.5	1.5	11.8	3.2	1.7	43.6
Intermountain West	27.9	23.4	3.7	8.6	3.9	1.6	48.1
Northern Great Plains	23.6	11.4	4.4	7.5	1.7	0.5	37.3
Southern Great Plains	27.2	9.1	4.3	7.9	3.1	1.2	37.9
Texas	12.1	6.9	4.0	9.2	1.9	0.6	25.8
Southeast	26.3	15.2	9.1	7.5	2.7	1.2	39.5
Midwest	46.5	27.4	10.7	7.7	2.1	0.2	57.1
Great Lakes	48.6	17.3	16.1	11.9	1.9	0.4	58.1
Northeast	41.0	24.4	15.5	9.0	1.5	0.6	53.6
Nationwide	34.4	19.3	9.7	8.7	2.2	0.7	47.3

Table 3-29

The Percentage of Vegetable/Fruit/Nut Producers With Losses by Wildlife Groups

Region	Rodents/ Rabbits	Hoofed Mammals	Birds	Omnivores	Carnivores	Other Wildlife	Any Wildlife
Northwest	20.4	19.6	31.5	2.9	0.6	2.6	53.1
Southwest	39.8	9.4	29.4	1.3	3.7	0.9	56.7
Mountains and Plains	11.4	10.6	12.1	11.6	1.3	1.0	36.0
South Central	22.3	10.9	19.7	14.5	6.5	1.9	49.3
Southeast	16.2	20.4	13.3	12.3	2.7	2.0	45.3
Northeast	17.0	19.4	11.2	12.7	0.6	1.3	40.8
Nationwide	20.4	16.6	16.6	10.5	2.3	1.5	45.5

Table 3-30

The Percentage of Producers With Stored Commodities With Losses by Wildlife Groups

Region	Rodents/ Rabbits	Omnivores	Birds	Hoofed Mammals	Carnivores	Other Wildlife	Any Wildlife
West Coast	18.1	0.3	3.9	1.2	0.2	0.0	22.4
Intermountain West	15.3	2.8	2.6	2.9	0.5	0.2	21.2
Northern Great Plains	11.2	1.1	1.1	0.9	0.7	0.2	14.0
Southern Great Plains	17.5	5.0	1.2	1.0	0.5	0.1	21.6
Texas	27.2	9.5	1.3	0.7	0.5	0.5	34.6
Southeast	25.0	2.6	2.7	0.2	0.4	0.0	27.7
Midwest	18.4	4.1	1.6	0.8	0.4	0.2	21.3
Great Lakes	14.2	4.0	2.4	2.5	0.2	0.3	19.3
Northeast	23.9	4.5	2.7	0.8	0.0	0.2	27.7
Nationwide	19.0	3.8	2.0	1.1	0.3	0.2	22.8

All ethics so far evolved rest upon a single premise: that the individual is a member of a community of interdependent parts. His instincts prompt him to compete for his place in that community, but his ethics prompt him also to cooperate (perhaps in order that there may be a place to compete for)...The land ethic simply enlarges the boundaries of community to include soils, waters, plants, and animals, or collectively: the land.... (Leopold 1989)

Many organizations and individuals share the ecological ethic of wildlife managers as identified by Leopold (1949), which stresses the importance of considering impacts on the ecosystem rather than the individual. Some of the ecological groups that participated in the scoping process for this EIS include the Nature Conservancy and the Sierra Club. Other ecological groups may be more aligned with beliefs that nature has rights and that man should not have dominion over nature (Nash 1989). These groups may be aligned with animal rights groups (Jamison and Lunch 1992). Debate continues within the natural resources profession about the appropriate ethical stance on the degree or methods by which ecosystems can or should be managed (Callicott 1990, Soule 1990, Ehrenfeld 1991). Hutchins and Wemmer (1986/1987) provide an excellent discussion of issues in wildlife conservation that involve animal rights concerns.

2. Humaneness

The issue of humaneness in the killing or capturing of wildlife is important to many people. Humaneness is an individual's perception of the impact of an action, and individuals may perceive the humaneness of various actions differently. For some, humaneness applies to only those actions taken by humans. Many organizations including environmental and animal welfare organizations, are concerned that some methods used by the APHIS ADC program to control wildlife damage are inhumane. In this situation, the issue is whether the methods used in a wildlife damage control activity expose the targeted animal to unnecessary pain and suffering. Research suggests that with some methods, such as the leghold trap, changes in the blood chemistry of trapped animals indicate the existence of some level of "stress" (Kreeger et al. 1988). The same blood measures indicated similar changes in foxes that had been chased by dogs for approximately 5 minutes within a 10-acre pen. Such research has not yet progressed to the development of objective, quantitative measures of pain or stress (Bateson 1991) for use in evaluating the humaneness of different control techniques.

Humaneness, as perceived by livestock producers, requires that vulnerable domestic animals be protected from predators. For example, sheep were domesticated and selectively bred for centuries to make them easy to manage. Aggressive tendencies and natural flight or fight capabilities have been taken away, making them defenseless, easy targets for attack. When a coyote attacks a sheep, the coyote generally attaches at the throat causing death by suffocation and respiratory failure (Connolly et al. 1976). The method of killing sheep used by coyotes would generally be considered inhumane. Because man has removed the natural defensive capabilities from most poultry and livestock species, some argue that man has a moral obligation to care for and protect these animals (Glosser 1993).

During the scoping process, a central sociocultural issue concerned animal welfare and the killing of wildlife. The terms "animal rights" and "animal welfare" are not synonymous (Schmidt 1990, Wywialowski and Reese 1991).

Animal welfare advocates are concerned about minimizing the pain and suffering of individual animals. Animal welfare advocates care about the well-being of the individual animal, unrelated to the perceived rights of the animal or an individual's importance to the dynamics of the species. Animal welfare organizations include the Humane Society of the United States, the Animal Protection League, and Defenders of Wildlife. The goal

of animal welfare organizations is to minimize the pain inflicted on animals and the unnecessary killing of animals. Most animal welfare organizations do not oppose the concept of wildlife damage control but support more restrictions on control methods perceived as inhumane, research into improved methods of control, and greater use of nonlethal controls such as guard dogs. They maintain that the program needs to be more sensitive to animal pain and suffering and the risks of releasing toxicants into the environment.

Animal rightists believe that animals have inherent "rights" comparable to humans (Singer 1975). Animal rights advocates oppose killing or harming animals for human gain. Groups most often associated with the animal rights movement include Trans-Species Unlimited, People for the Ethical Treatment of Animals, and the Animal Liberation Front. At the extreme, they support (1) the total elimination of commercial and sport hunting and trapping, (2) the total dissolution of commercial animal agriculture, and (3) the total abolition of the use of animals in science (Bleiberg 1989). The leaders of the animal rights movement and active supporters of the movement may not share all beliefs. For example, animal rights leaders oppose pet ownership while 87% of animal rights activists at the March for Animals in the summer of 1990 approved of pet ownership (Jamison and Lunch 1992). Similarly, many of the appeals to the public by animal rights groups may be emotional appeals against perceived inhumane treatment of animals and against seemingly unreasonable use of animals in research (Schmidt 1987), rather than a philosophical argument for the rights of animals. Consequently, many members of animal rights organizations may be more against animal cruelty (i.e., animal welfare advocates) rather than for animal rights. Relative to the general public, animal rights activists tend to be well-educated, middle class, female and politically active (Richards and Krannich 1991, Jamison and Lunch 1992).

3. Service Recipients

Persons or groups that routinely bear the cost of wildlife-caused damage also have strong opinions concerning wildlife damage control. Ranchers and farmers feel that predators and other wildlife adversely affect their livelihood by killing livestock, eating crops or by competing with livestock for available forage. Among producers, many attach high positive values to wildlife and understand that conservation is part of good environmental stewardship. Many producers are also economically and ethically interested in the welfare of animals and the land. Individuals and groups that sustain nonagricultural wildlife-caused losses may also value wildlife, but see a need to reduce wildlife-caused losses or hazards.

Examples of service recipients include:

- Crop and livestock producers.
- Individuals who favor the protection of threatened and endangered species from competing or depredating wildlife.
- Individuals who have suffered wildlife damage to their houses and property.
- Individuals who use air travel or are concerned with the potential for bird/wildlife aircraft strikes.

The program beneficiaries hold varied attitudes and levels of awareness about the program. Probably the largest group within American society that benefits economically from program activities (i.e., consumers of crops and livestock protected by the program) is unaware of the program's existence.

The Federal wildlife damage control program has historically placed most of its efforts on reducing predator-caused losses to wildlife; and predator control is one of the most controversial aspects of the program. Several studies (Stuby et al. 1979; Arthur and

Gum 1981; Kellert and Berry 1980) have been conducted on public attitudes toward predator control. Stuby et al. (1979) found a relatively low level of awareness in American society regarding predation; less than half of the respondents were aware of the losses of sheep to coyotes. The respondents expressed almost equal concern for the killing of coyotes by humans and for the killing of sheep by coyotes. Although 77 percent of respondents supported the right of a rancher to destroy an animal that had killed his livestock, less than half approved of killing other animals of the same species to prevent further loss. With respect to control methods, lethal methods were less acceptable than nonlethal controls. In rating criteria for evaluating control methods, respondents rated humaneness first, then specificity for target animals, then cost effectiveness.

Of all livestock producers, sheep producers are most likely to sustain losses to wildlife, and more information is available on losses and effects of losses for this group than other producer groups. The USDA National Agricultural Statistical Service (NASS) sheep and goat report for February 1988 (USDA 1989) described depredation as an "important factor" contributing to the decline of the sheep industry. In a study entitled *Factors in the Decline of the Western Sheep Industry* (Gee et al. 1977a), high predation losses were reported to be a major factor in producers' decisions to stop sheep operations. In four States included in the study, producers identified depredation as the major reason for discontinuing sheep operations. The problem was more significant for larger operations, probably because open range grazing, where sheep are more vulnerable to predator attacks, is more typical for larger operations.

A study of New Mexico livestock owners by Buys (1975) suggests that over 90 percent of sheep producers feel that a large amount of predator control is necessary for the survival of the sheep industry. Similarly, over 50 percent of cattle ranchers felt that a large amount of predator control is necessary for the survival of the cattle industry. During the scoping process for this EIS, many producers reported a high level of frustration with the extent of the losses and with the restrictions on chemical control methods that they believe are necessary to reduce losses.

In addition to the positive value placed on farming and ranching by the individual producer, society places a high social value on agriculture. This social value is derived in part from the view that food production represents the backbone of the national economy. Historically, food production in the United States in adequate quantities and with efficient delivery and distribution systems has resulted in a strong economic base. Self-sufficiency in food production is a high national priority.

Other factors contributing to the social value of agriculture include a high quality of life, the need for societal diversity, and the preservation of open spaces. A widespread sentiment in the United States is summarized in a statement by Senator Patrick Leahy, Chairman of the Senate Committee on Agriculture, Nutrition, and Forestry: "There is a quality to rural living—as I know well from my own home town in Vermont—that is very different from urban life. There is a place, a friendliness among neighbors and a system of values which seem to me hard to find in urban settings" (Leahy 1989). Many people feel a sense of satisfaction just knowing that rural areas exist, where the pressure of urban life can be forgotten.

In the 1982 presentation "Economic Effect on the Family, the Community, and the County," Dr. Robert Kensing, an economist with the Texas Agricultural Extension Service, reported, "Predation is a major cause of the almost complete liquidation of sheep and goats [operations] from central Texas." Kensing (1982) also reported that most sheep and goat operations are family farms, and the effects of predation on these operations include a decline in total income, loss of benefits from diversification, and the necessity to seek off-farm income. In addition, when these operations are discontinued, the family loses the opportunity to work together, a factor benefiting family life.

F. Physical Environment

The physical environment that potentially could be affected by the current APHIS ADC program or the alternatives includes the air, water, soil, and human health in all places where wildlife damage occurs or where damage control could be applied. However, the level of potential impact by APHIS ADC methods on the physical environment is low, given the controls implemented by the USEPA on pesticides and the small amount of chemicals used by APHIS ADC. Therefore, in keeping with CEQ guidelines and the programmatic, national scope of this EIS, the existing physical environment is not discussed in detail.

Chapter 4

Environmental Consequences

Chapter 4: Environmental Consequences

Provides an analysis of the alternatives discussed in Chapter 2 and the effects on the environment discussed in Chapter 3. The consequences are presented as:

- Impacts of the five alternatives on the biological, economic, sociocultural, and physical environments.
- Impacts of protecting crops, livestock, facilities and structures, and public health and safety on species abundance and diversity.
- Direct, indirect, and cumulative impacts.
- Unavoidable impacts and irreversible and irretrievable commitment of resources.
- Comparison of impacts by alternatives.

Chapter 4

Environmental Consequences

Table of Contents

D. Introduction

Chapter 4 forms the scientific and analytic basis for the comparison of impacts among the alternatives. The discussion includes environmental impacts of the alternatives, local and national impacts, environmental effects that cannot be avoided, short-term and long-term impacts, and irreversible and irretrievable commitment of resources. The discussion also specifies the significance of direct, indirect, and cumulative impacts. The present Animal and Plant Health Inspection Service (APHIS) Animal Damage Control's (ADC) program incorporates many policies and procedures intended to minimize adverse environmental impacts of program activities. The analysis of the Current Program Alternative incorporates consideration of standard operating procedures. These are discussed in detail in Chapters 1, 2, and 5.

The environmental impacts or consequences of implementing the No Action Alternative, Current Program Alternative, Nonlethal Control Program Alternative, Nonlethal Before Lethal Control Program Alternative, and Damage Compensation Program Alternative are discussed in this chapter, along with a comparison and analysis of those impacts. The conclusions presented in this analysis are intended to guide decisionmakers in selecting an alternative for the APHIS ADC program. This chapter will guide decisionmakers in developing the Record of Decision in compliance with the National Environmental Policy Act (NEPA).

The public and governmental agencies provided many comments on the analysis of environmental impacts presented in the Draft Environmental Impact Statement (DEIS) and the Supplement to the DEIS. As a result of careful consideration of these comments, the discussion of potential impacts has been revised and expanded. In particular, this chapter now includes a revised discussion on the impacts of APHIS ADC control methods, based on the findings of the risk assessment detailed in Appendix P. The analysis of potential economic impacts has also been extensively revised and includes additional data regarding APHIS ADC expenditures and operations and the extent of wildlife damage. To facilitate understanding of the potential impacts of alternatives not presented in detail in this final Environmental Impact Statement (EIS), a comparison of impacts of those alternatives with the alternatives presented in detail has also been included.

The Current Program Alternative is APHIS' preferred alternative and is analyzed as the existing situation to which the other alternatives are compared. This is in contrast to the more common, project-specific EIS in which the No Action Alternative is usually the existing situation to which the other alternatives are compared.

The current APHIS ADC program implements wildlife damage control through either direct control, technical assistance, or a combination of the two methods. Direct control is conducted by APHIS ADC personnel in the field. Through technical assistance, APHIS ADC personnel provide advice, recommendations, information, or materials to resource owners, who then conduct their own control work. The effects associated with either direct control or technical assistance may result in positive, negative, direct, indirect, or cumulative impacts.

APHIS ADC program data on animals killed are compiled by State and not at the local level. Therefore, the State is the geographic unit of analysis for APHIS ADC program impacts. National statistics were obtained by aggregating State totals.

The selection of specific wildlife damage control methods for application to specific problems was described in Chapter 2. The methods are described in detail in Appendix J, and the impacts of their collective use in an Integrated Pest Management (IPM) approach on the biological, sociocultural, economic, and physical (including human health) environments are described in the following sections of this chapter.

E. Impact Evaluation Procedures

The procedures used in this EIS for evaluating environmental impacts include the identification of impacts that are direct, indirect, short term, long term, or cumulative. They also include a process for determining the relative importance of the impacts and their significance under NEPA. Although these procedures apply generally, some impacts must be evaluated on a different basis. Impacts on humans are considered important if they affect the health and safety of one or more individuals. However, impacts on plants or animals are generally considered in terms of the effects on populations, species as a whole, communities, or ecosystems. Impacts on the physical environment are most important when they affect humans or resources important to humans. Economics is a means of measuring monetary impacts on resources, and various impacts have different economic implications. Social impacts also result from wildlife damage control measures. All of these factors were considered in the identification and evaluation of impacts in this EIS.

The impacts addressed in this EIS are those that can be reasonably attributed to the present APHIS ADC program or that could be expected from the No Action Alternative, Nonlethal Control Program Alternative, Nonlethal Before Lethal Control Program Alternative, or the Damage Compensation Program Alternative. The impacts of the alternatives are evaluated on their own merits and in relation to impacts of other activities. As a matter of perspective, it should be recognized that the impacts of the present APHIS ADC program are a small part of the wildlife management impacts throughout the country. Wildlife managers may seek to increase or reduce populations of animals for various purposes, one of which is the reduction or control of damage caused by wildlife.

Four factors were considered in the evaluation of biological impacts. The **magnitude** of an impact reflects relative size or amount of an impact. The **geographic extent** of an impact considers how widespread the program impact might be. The **duration and frequency** of an impact (whether the impact is a one-time event, intermittent, or chronic) also helps define its limits. The **likelihood** of an impact (whether the impact is likely to occur) is the final evaluation factor. By considering each of these factors, the evaluation of impacts is kept uniform and systematic. Where a quantitative evaluation is possible, specific criteria for the magnitude, geographic extent, duration and frequency, and likelihood of impacts are used.

This evaluation process also is used to determine the significance of the impacts pursuant to Council on Environmental Quality (CEQ) regulations (40 CFR 1508.27). To determine the significance of an impact, all four of the evaluation factors must be considered together. Table 4-1 presents possible combinations of impact levels for determining the NEPA significance of adverse biological impacts.

The threatened and endangered species impact assessment is guided by the provisions of the Endangered Species Act (ESA) of 1973, as amended. The Endangered Species Act prohibits the taking (broadly defined) of endangered species within the United States. Any unlawful taking of a threatened or endangered (T&E) species is considered significant. However, the Act allows taking that otherwise would be prohibited if such taking is incidental to, and not the purpose of, a lawful activity. Some listed species also may be intentionally taken as target species within ESA guidelines (e.g., gray wolves in Minnesota).

Table 4-1

Criteria for Determining Significant Adverse Biological Impacts

	Level of Impact			
Impact Rating[a,b]	Magnitude	Geographic Extent	Duration and Frequency	Likelihood
Significant[c] (as defined by NEPA)	High	High or Medium	Any level	High
	High	High or Medium	High	Medium
Moderate	High	Any level	Medium or Low	Medium
	High	Low	Any level	High
	Medium	Any level	Any level	Medium
	Medium	Any level	Any level	High
	High	Any level	Any level	Low
	Low	High	High	High
Low	Low	Medium or Low	Any level	High
	Low	Any level	Any level	Medium

[a] The impact rating is an analysis of the magnitude, geographic extent, duration and frequency, and likelihood of an impact occurring, and is based on a significance level for each of the preceding categories ranging from low to high.
[b] Threatened and endangered species are not evaluated by these criteria, but by standards established under the Endangered Species Act of 1973 and subsequent amendments.
[c] As described in NEPA (1508.27), significance varies with setting of the proposed action and requires consideration of both context and intensity. Context refers to the analysis of an action as it affects society as a whole, the affected region, the affected interests, and the locality. Intensity refers to the severity of the impact.

F. Biological Impact Assessment

This section presents information on the biological impacts of the five program alternatives covered in detail in this EIS. Impacts on wildlife species diversity, target and nontarget species, and listed T&E species are considered.

1. No Action Alternative

For purposes of this EIS, the ADC program administered by APHIS would not exist under the No Action Alternative. No technical assistance, direct control, or research would be undertaken by APHIS personnel for the purpose of wildlife damage control, and no APHIS funds would be provided for wildlife damage control activities.

Wildlife is a publicly owned resource in the United States, so management of wildlife damage is a responsibility that must be shared by the public. Without the APHIS ADC program, some current program functions probably would be conducted by other Federal, State, and local agencies, because many of these agencies are APHIS ADC program cooperators or already conduct some wildlife damage control activities. However, some APHIS ADC program functions would be conducted by certain interest groups or individuals. Current APHIS ADC program cooperators would carry much of the burden for wildlife damage control.

The following sections are an assessment of the potential impacts of the No Action Alternative. The discussion addresses the expected effects of certain APHIS ADC program functions being assumed by (1) other Federal agencies, (2) State and local agencies, and (3) individuals and private organizations.

a. Program Functions Assumed by Other Agencies

Because wildlife damage is unacceptable to some segments of the public, some program functions probably could be assumed by other Federal agencies if the APHIS ADC program was discontinued. These functions could include protection of public health and safety; control of damage caused by wildlife species for which there is a Congressional mandate for management, such as T&E species or migratory birds; and control of wildlife damage in situations where there is a congressionally mandated directive with appropriations. The methods of control and impacts would presumably be similar to those of the present APHIS ADC program to the extent the methods of control and budget are the same. Otherwise, the results could be similar to one of the other alternatives.

(1) Grazing Lands and Other Agricultural Resources

Some Federal agencies operate under a mandate to provide multiple-use opportunities on the lands they administer. In the absence of an APHIS ADC program, this mandate could lead some of these agencies to consider conducting wildlife damage control. For example, if no predator control is conducted on grazing lands administered by the U.S. Department of Interior (USDI) Bureau of Land Management (BLM) or the USDA Forest Service (FS), depredation of livestock would increase. O'Gara et al. (1983) documented annual lamb losses to predators of up to 29 percent when coyote control was withheld from a Montana ranch, and Hulet et al. (1987) estimated that annual sheep losses could be as high as 44 percent without effective predator control. The FS uses grazing to control some types of competitive vegetation. The feasibility of habitat management by livestock grazing could decrease without the availability of wildlife damage control. If depredation occurs at high levels, some livestock producers could go out of business. Gee et al. (1977a) reported depredation loss as the most important reason cited by former Wyoming and Utah sheep producers for discontinuing sheep production. Some grazing allotments might be assumed by other producers, but others would be vacated.

The U.S. Department of Agriculture (USDA) Extension Service (ES) provides many training, educational, and community development services to rural and agricultural communities. The ES currently cooperates with APHIS ADC program control efforts in many States. Without the APHIS ADC program, it is likely that the number of requests for ES assistance would increase, especially for types of wildlife damage problems that affect individuals not represented by producer organizations. The ES is a widely known provider of agricultural assistance and would probably respond to demands for services as much as the budget would allow. The ES probably would provide technical assistance rather than direct control.

(2) Public Health and Safety

Public health and safety agencies currently are responsible for disease control. However, APHIS ADC frequently cooperates with these agencies to help monitor or control wildlife-borne diseases (e.g., rabies). Under the No Action Alternative other Federal, State, or local agencies would probably assume greater responsibility for controlling such diseases, because zoonotic diseases could potentially affect large segments of the human population (e.g., urban, suburban, and rural). The intensity of application would vary widely across the country, depending on the severity of the problem, the level of funding available for programs, the number of people affected, and the desire of the affected community for the implementation of a control program.

Implementation of the No Action Alternative would make it more difficult for the Federal Aviation Administration (FAA) to require airport authorities to provide private and public air travelers and pilots with an adequate level of protection. Wildlife damage prevention efforts at airports would not cease under the No Action Alternative, but APHIS ADC program expertise and assistance would no longer be available to individual airports. Presumably, some activities of the present program, like runway protection, would be assumed by USDI Fish and Wildlife Service (USFWS) or U.S. Department of Transportation (USDOT). In the case of military facilities, individuals from the service-support components of the various armed forces of the United States would be solely responsible for conducting appropriate levels of control to ensure limited potential for wildlife aircraft strikes at operational military facilities.

The American public expects a high level of health and safety protection. Under a No Action Alternative, the increased possibility of aircraft strikes, along with possible loss of human life, and the increased potential for human exposure to zoonotic diseases represent potentially significant impacts on public health and safety.

(3) Wildlife

Wildlife damage control activities to protect wildlife are conducted through cooperative agreements between the APHIS ADC program and other agencies. Programs are also mandated by Congress; therefore, under the No Action Alternative these programs would continue under authorities designated to other agencies.

For example, national wildlife refuges were established to protect or enhance certain desired species (usually migratory waterfowl) and provide habitat that would otherwise be limited or lost. The refuges are managed primarily for a limited number of species but provide incidental habitat and protection for additional wildlife species, such as predators or competitors of the species for which the refuge is managed. To successfully enhance the production of desired species, it is sometimes necessary to reduce the populations of competing species. These actions generally are the responsibility of USFWS at national wildlife refuges or of State natural resource agencies at State refuges. The APHIS ADC program provides wildlife damage control assistance on or near these areas as requested by USFWS or appropriate State agencies. Without the APHIS ADC program, these activities presumably would be conducted solely by USFWS with their own personnel or by contract with private organizations. The methods would be expected to be similar to those used under the present APHIS ADC program and have similar impacts. Presently, APHIS ADC is required by U.S. Environmental Protection Agency (USEPA) regulation to maintain registrations for many chemicals used. However, the use of some chemical methods could be lost within a few years unless another agency or organization developed a research capability to support these chemical registrations, as is now conducted by APHIS.

The USFWS has the mandated responsibility for managing migratory birds and the regulatory authority for all taking of migratory birds. The USFWS currently cooperates with the APHIS ADC program in bird damage control. Under the No Action Alternative there probably would be increased demand for the USFWS to provide bird damage control activities to replace the current level of control. If they choose to do so, the methods and impacts could presumably be similar to those of the present APHIS ADC program. If the USFWS chooses not to provide bird damage control, the impacts would be as described later in the section on Program Functions Assumed by Individuals and Private Organizations.

The USFWS also is responsible for the management and protection of federally listed T&E species wherever they occur in the country. In some situations, wildlife damage control activities are conducted to protect a T&E species from other wildlife. The APHIS ADC program may be requested to assist with these activities. Examples include trapping of coyotes to protect the San Joaquin kit fox and removal of the arctic fox from islands

where the Aleutian Canada goose nests. Under the No Action Alternative, the USFWS would have to conduct all their own damage control activities, and impacts similar to the current program would be expected.

b. Program Functions Assumed by States

Under the No Action Alternative certain functions currently conducted by the APHIS ADC program would probably be assumed by States. All States currently cooperate with the APHIS ADC program to some degree. The extent of wildlife damage assistance provided by State agencies varies. Some States currently administer or conduct their own programs to control damage caused by all wildlife species. Others respond only to damage associated with game species. States that currently provide funding to the cooperative APHIS ADC program could redirect these funds to State agencies for similar work. For example, Utah charges sheep producers a "head tax" for each sheep, the proceeds of which are used for predator control. Those funds are now used as contributions for the State's cooperative program with APHIS ADC, but the funds could be used by the State alone for the same purpose. In some States, counties choose to either participate in the State wildlife damage control program or conduct or administer their own control program. In counties that conduct their own program, the mechanism probably would not have to change.

States could administer wildlife damage control programs in the following ways: (1) designate a State agency to conduct programs on a Statewide basis or fund counties and cities to conduct local programs; (2) establish a bounty system; (3) use private pest control contractors; or (4) establish a compensation program. States also could decide which functions would be part of the State program. These decisions would be based on authorities, demand, costs and benefits, financial constraints, and the political climate of the State. The impacts of the four approaches are discussed in the following sections.

(1) State/Local Agency Programs

In the absence of an APHIS ADC program, it is assumed that wildlife damage control programs conducted by State and local agencies would use the same methods and many of the same people now employed by the APHIS ADC program. Based on this assumption, most of the impacts would be similar to those of the current program. However, there are two notable exceptions. First, without an APHIS ADC program, a research program focused on improving wildlife damage control methods, as is currently conducted by the Denver Wildlife Research Center (DWRC), would not exist unless a State or local agency initiated it. Without DWRC research, technology could advance less rapidly, and USEPA pesticide registrations would be difficult to maintain. If registrations were not maintained, wildlife damage control probably would be less efficient and have greater environmental impacts than if research were continued. Second, because the present APHIS ADC program provides a ready mechanism for coordinating wildlife damage control efforts across political boundaries, a national perspective or coordination would be lost, such as information regarding damage interactions with wide-ranging species of special concern, permit procedures, and the potential cumulative impacts addressed by the NEPA process.

(2) Bounty Systems

One consequence of the No Action Alternative could be the reestablishment of bounty systems in selected locations of the country as a means of wildlife damage control. The bounty system has been used in various areas of the United States since 1630 (Cain et al. 1972). Early settlers used a bounty system as a means of protecting their crops and livestock from depredating wildlife. A bounty was offered on animals causing damage to crops or livestock, and payment was made for proof of elimination of the offending species. Bounty systems (with modifications) continue to be used in a few locations.

Bounties generally are not effective in controlling wildlife damage for a variety of reasons. No matter how carefully a bounty program is regulated, killing of animals not responsible for damage and fraudulent claims are likely to occur (Waller and Errington 1961). In addition, offending animals may become shy of humans and traps, eluding capture and continuing damage. Since the focus of APHIS ADC is to stop damage, as opposed to capturing a large number of animals, the necessary time will be taken and a variety of tools may be used to stop the offending animal. The objective of bounty hunters is to collect as many bounties as possible; it is not efficient use of their time or equipment to spend it on shy animals.

(3) Private Contractors

In the absence of an APHIS ADC program, contracting with private pest control contractors by State-administered wildlife damage control programs could have various results. The State staff could be a small group of contract administrators and seasoned wildlife damage control professionals. Their success would greatly depend on their ability to write contract specifications that would accomplish the required level of wildlife damage control and verification. If the contract incentives were adequate and the specifications stringent, many well-trained professionals could be attracted to the contract business and new people would be trained. Under tight supervision, efficient wildlife damage control could be accomplished and the environmental impacts would be similar to those of the current program. If the contract specifications were not stringent, and if price competition dominated, more work would be done by relative amateurs; the resulting efficiency probably would be variable and generally lower and the adverse environmental impacts higher than those of the current program (e.g., more nontarget species taken and pesticides improperly applied).

The following are possible outcomes of a State-administered contract program for wildlife damage control: State staffing requirements could be minimized; contracting could facilitate prompt responses to specific needs or funding changes; and contracting could take advantage of the efficiency incentives of private enterprise. On the other hand, short-term contracts could hamper development of professional expertise among the contractor staff. Also, control of contractors would be less direct than control of a government staff, and needed corrections in program activities would be more difficult to achieve.

(4) Compensation Programs

It is assumed that existing State compensation programs and other similar programs that might be implemented under the No Action Alternative would have impacts similar to the Federal program described for the Damage Compensation Program Alternative. For example, Wisconsin has a compensation program for wildlife damage attributable to white-tailed deer, Canada geese, black bears, and T&E species. This program is described in Chapter 2.

c. Program Functions Assumed by Individuals and Private Organizations

Individuals have various incentives to control wildlife damage problems on their own. The greatest incentive for individuals to control damage would be the absence of a governmental wildlife damage control program. Such individuals could pursue several courses of action. Crop or livestock producers could join together in producer associations to share information, hire professionals, or control wildlife damage themselves. Homeowner associations could do the same for certain problems. Many individuals probably would deal with wildlife damage control problems with whatever methods they perceive to be least expensive or most effective.

Damage control actions could range from the hiring of private pest control companies to the use of any available lethal or nonlethal method. Individuals who are unsuccessful in controlling severe damage might have to abandon the crop or property.

Biological impacts under the No Action Alternative are expected to be higher than for the Current Program Alternative for several reasons. Individuals, highly motivated to protect their property might be less concerned about environmental protection. In addition, most individuals would lack wildlife damage control expertise and as a result could be less effective and selective than wildlife damage control specialists in applying control methods.

Under the No Action Alternative, use of quick, easy, cheap, or makeshift methods of wildlife damage control would be expected, including misuse of commonly accepted methods because of inexperience and application of chemicals for purposes other than those for which they are registered (White et al. 1989). Use of illegal methods also might be expected to increase.

Enforcement of regulations to minimize misuse of control methods would be difficult. Proper disposal of leftover chemicals would be impossible to guarantee. The frequency of chemical misuse could increase, resulting in greater unintentional exposure of wildlife and humans to toxicants and increased risks to public health and safety.

Because of reduced accountability under this scenario, the level of take for target and nontarget species would be largely unknown to the agencies charged with managing wildlife populations. Management decisions would be less informed and more likely to adversely impact wildlife populations.

The likelihood that T&E species would be adversely affected would increase substantially, because people who are not required to be informed about these species would conduct much of the wildlife damage control. Consequently, any impacts that did occur also could be more severe. Protection and enhancement efforts could be hampered because of unreported control activities.

d. Summary of Biological Impacts

Biological impacts that would be expected under the No Action Alternative include all impacts that occur under the Current Program Alternative plus impacts that relate to the reasons listed previously. The level of taking of target species would be more variable (i.e., lower for some species in some areas and higher in other areas). However, the amount of taking of nontarget species probably would be higher and, for some small populations, could become biologically significant. This would be especially important if the species was threatened or endangered. Species diversity could be significantly affected. The indirect impacts on nontarget species affected through the food chain or by uncontrolled releases of toxicants into the environment also could increase. In some areas, many people could be using chemical methods. Misuse of chemicals could increase and thereby adversely impact certain wildlife populations and public health and safety.

2. Current Program Alternative

The present APHIS ADC program uses an IPM approach in which a series of methods may be used or recommended to control a given wildlife damage problem. The first control method of choice may be to change resource management practices to prevent damage. If that option is not available or successful, other methods, such as physical exclusion or wildlife management may be tried. However, control of wildlife damage may require that the offending animal(s) be killed or that local populations of the offending species be reduced. Potential impacts resulting from the application of various control methods are evaluated in this section.

Wildlife damage control methods and their impacts may be categorized as (1) resource management methods such as moving vulnerable livestock to safer grazing areas or increasing animal husbandry efforts, (2) physical exclusion or fencing to separate damaging animals from resources that need protection, and (3) wildlife management methods to frighten away or remove the animals causing damage.

Nonlethal techniques such as animal husbandry, exclusion, fencing, frightening devices, and relocation are generally considered to have less adverse impact than lethal methods, but most nonlethal methods do have impacts.

Animal husbandry resulting in the moving or concentration of livestock causes an increase of vegetation trampling, orphaned livestock, livestock parasites and an increased use of fencing. Guarding dogs have their own biological impact; they often kill and harass nontarget species of wildlife, and to be effective require that livestock be concentrated.

Exclusion can redistribute wildlife damage by causing the excluded animals to move elsewhere. Moving more animals into one habitat by excluding them from another can increase competition. If the competition is for food, excess animals may starve. Some habitat degradation also may occur under the increased competition; the overall carrying capacity of the habitat may be reduced, resulting in the survival of fewer animals. If the competition is for cover, some animals may be forced into less cover and become more vulnerable to other mortality factors such as predation, stress, or disease. If the competition is for reproductive sites, some animals may not reproduce or may do so at reduced rates. The result of this increased competition may be a reduction in the animal population.

Fences may inadvertently trap, catch, or affect the movement of nontarget wildlife. Coyotes may use fences to trap deer and antelope to the point of depressing the latter populations below the normal carrying capacities of the unfenced habitat.

Frightening devices can disturb nontarget wildlife, potentially affecting nesting birds and the movement of undulates. In addition, pyrotechnics are a potential fire hazard.

Physical relocation of wildlife to control damage generally causes the same adverse impacts from increased competition as occur with exclusion. Relocated animals tend not to remain at release sites (Phillips et al. 1991). They suffer high mortality rates (Rosatte and MacInnes 1989). Additionally, the transfer of infectious diseases is possible (Nettles et al. 1979; Jenkins and Winkler 1987; Nielson 1988). For this reason, relocation of some species is prohibited by law in certain States.

Lethal control methods may be selective either for individual offending animals or for the target species. Where only the animals responsible for damage are killed, populations generally would not be affected unless the population is small and the animals removed represent a percentage larger than what their reproductive capacity is able to replace. Significant impacts on species would occur only if the animals removed represent a large portion of the total population. Less selective methods are more likely to impact nontarget animals. However, take records indicate that nontarget animals are taken in lower numbers and lower proportions of their populations than are the target species.

a. Impacts Evaluated

The fundamental biological impacts evaluated in this EIS are the effects on abundance and diversity. For purposes of this EIS, abundance is defined as the number of individuals in the population of a species. Abundance may be affected by changing the ability of the population to maintain itself, either by removing more individuals than will be replaced through reproduction and immigration, or by modifying the availability of the basic life requisites (i.e., food, shelter, etc.). Diversity is defined as the number of species

in a specific area and can be affected only if the number of species in an area is changed. Abundance and diversity are appropriate measures of the biological impacts of the alternatives considered, based on the following assumptions:

- Abundance is a measure of a species' success in inhabiting a given area; generally, the greater the number of individuals of a species, the more likely it is that the species will maintain a viable population in the area.
- There is a general correlation between abundance of a species responsible for damage in a given area and the extent of damage (i.e., the potential for damage or conflict increases with the abundance of a species that causes damage). For substantiation of such a relationship between coyotes and sheep, see Wagner (1988).
- Diversity can be used as a biological indicator of the quality of the habitat. Greater diversity in a given area is an indication of higher habitat quality, even if most species are not very abundant (Odum 1971).
- The decision to use abundance and diversity as measures of biological impacts is related to the potential for the APHIS ADC program to adversely impact existing healthy populations of target animals and nontarget animals, particularly T&E species.
- It is assumed that wildlife management agencies attempt to maintain viable populations of harvested species by holding annual harvests at or below the species' allowable harvest levels, even if those levels are based only on professional judgment.
- Species diversity can be affected by local eradication of isolated populations.

(1) Evaluation Approach

Two approaches are used in this EIS to evaluate APHIS ADC program impacts on species abundance. The first is an assessment of impacts on the 17 target species or species groups that are taken in substantial numbers by the program (see following list). This assessment is as quantitative as possible for each species, considering the magnitude, geographic extent, duration and frequency, and likelihood of occurrence of the impact, as mentioned previously. The methods for the evaluation, the criteria for each evaluation factor, and the application of each factor in the evaluation of short-term and long-term impacts are described in following sections.

This second impact assessment approach addresses impacts on nontarget species. An important part of this approach involves an ecological risk assessment of the chemical methods used in direct control by APHIS ADC. The results of that study are used to develop the section of this chapter on biological impacts of chemical methods. Similarly, a risk assessment process is used as a means of evaluating the impacts of nonchemical methods on nontarget species. The results of these assessments are contained in Appendix P.

For both target and nontarget species, indirect impacts and cumulative impacts of various program activities are also evaluated. This assessment is primarily qualitative and uses the systematic approach described previously to make sure that all aspects of an impact are considered in determining its significance. Because this part of the impact evaluation is qualitative, no specific criteria for applying the evaluation factors are established. Instead, the factors are used as reminders and guidelines for professional judgment.

The 17 target species (or species groups) analyzed in detail are:

- **Mammals**
  - Badger
  - Beaver
  - Black bear
  - Bobcat
  - Coyote
  - Gray fox
  - Red fox
  - Mountain lion
  - Nutria
  - Opossum
  - Porcupine
  - Prairie dog
  - Raccoon
  - Striped skunk
- **Birds**
  - Blackbird group
  - European starling
  - Cattle egret

The 17 target species or species groups selected for analysis are regularly killed by the APHIS ADC program; therefore, these species would be the most likely to suffer significant impacts. These species represent two taxonomic classes of animals (mammals and birds) that cause damage. The types of damage caused by these species represent the major damage problems addressed by the APHIS ADC program. Many other species of mammals and birds cause damage to resources protected by the APHIS ADC program. For purposes of this EIS, the impacts described for the 17 target species are considered representative of the impacts on other species.

A full range of lethal and nonlethal control methods is used to control damage caused by these 17 species, which occur over a wide geographic area of the United States. Damage caused by these species is expected to continue for the foreseeable future, so control actions also are likely to continue. Impacts and potential impacts of taking these 17 species are considered representative of damage control activities throughout the APHIS ADC program.

(2) Evaluation Factors

(a) Magnitude

Magnitude is defined as a measure of the number of animals killed in relation to their abundance. In this analysis, magnitude is evaluated first in terms of total harvest, then in terms of the APHIS ADC program kill. Magnitude evaluations for each of the 17 major target species are limited to States in which these animals were killed by the APHIS ADC program. The procedures for determining magnitude are detailed in Figure 4-1.

In this EIS, magnitude is determined either quantitatively or qualitatively for each major target species in each State or region. The quantitative method is used wherever possible because it is more rigorous; it is based on an allowable harvest level, State population estimates, and harvest data. Qualitative methods are based on State population trends and harvest data or regional population trends and population modeling.

Magnitude evaluations are calculated for both total harvest and APHIS ADC kill. The APHIS ADC kill ratings are then aggregated into an overall assessment of magnitude for each species. Magnitude is considered along with ratings for geographic extent, duration and frequency, and likelihood to determine NEPA significance of the APHIS ADC program kill on each of the 17 target species analyzed in detail in this EIS (Tables 4-1, 4-31). The development and application of criteria to make quantitative or qualitative determinations for magnitude are described in the following paragraphs.

Criteria for Quantitative Determinations

This impact evaluation is based on APHIS ADC program records of animals killed during FY 1988. For purposes of this EIS, FY 1988 is considered representative of a typical year for APHIS ADC program activities. Available harvest data for 1987-88 (denoted FY 1988) from State wildlife management agencies are also used in the analysis. If FY 1988 harvest data are unavailable, the most recent harvest information is used as surrogate data.

Quantitative determinations for magnitude of total harvest and APHIS ADC kill for a species are based on the allowable harvest level, total harvest, APHIS ADC kill, and population estimate for each State. Allowable harvest levels are available for eight of the 17 target species analyzed in detail in this EIS (Table 4-2). The use of allowable harvest levels in managing wildlife populations provides for long-term maintenance of animal populations and therefore is appropriate in establishing criteria for determining magnitude.

To quantitatively determine total harvest magnitude for a species, the total harvest is calculated as a percentage of the most current population estimate for that State. If a range of population estimates is reported for a species in a State, the midpoint is used in the

analysis. The total harvest percentages for each State are then compared to the allowable harvest level for the species to determine total harvest magnitude. Magnitude ratings are based on the following criteria:

- If the total harvest is less than 75 percent of the allowable harvest level, the magnitude is considered low.
- If the total harvest is 75 to 100 percent of the allowable harvest level, the magnitude is considered moderate.
- If the total harvest is greater than 100 percent of the allowable harvest level, the magnitude is considered high.

The harvest percentages corresponding to low, moderate, or high magnitude for each of the eight species used in this analysis are shown in Table 4-2.

Table 4-2

Magnitude of Harvest Impacts Based on Allowable Harvest Levels[a]

		Magnitude of Impact at Various Harvest Percentages[c]		
Species	**Allowable Harvest Level**[b] **(percent)**	**Low**	**Moderate**	**High**
Beaver	30[d]	<23	23-30	>30
Bobcat	20[e]	<15	15-20	>20
Black bear	20[f]	<15	15-20	>20
Coyote	70[g]	<53	53-70	>70
Red fox	70[h]	<53	53-70	>70
Gray fox	25[i]	<19	19-25	>25
Mountain lion	30[j]	<23	23-30	>30
Raccoon	49-59[k,l]	<37	37-49	>49

[a] The allowable harvest level provides for the long-range maintenance of the species. Any higher harvest level could cause a decline in abundance.

[b] The assumption is made that these values can be applied nationally.

[c] The impact for magnitude is low, moderate, or high based on a harvest rate of less than 75 percent, 75-100 percent, or greater than 100 percent of the allowable harvest level.

[d] Novak 1987.

[e] Rolley 1985.

[f] Koch, D., personal communication, December 13, 1989; Pelton, M., personal communication, December 11, 1989; Willey, C., personal communication, December 11, 1989.

[g] Connolly and Longhurst 1975.

[h] Davis 1974a. No distinction between red and gray foxes is made in the report. This value is applied to the red fox.

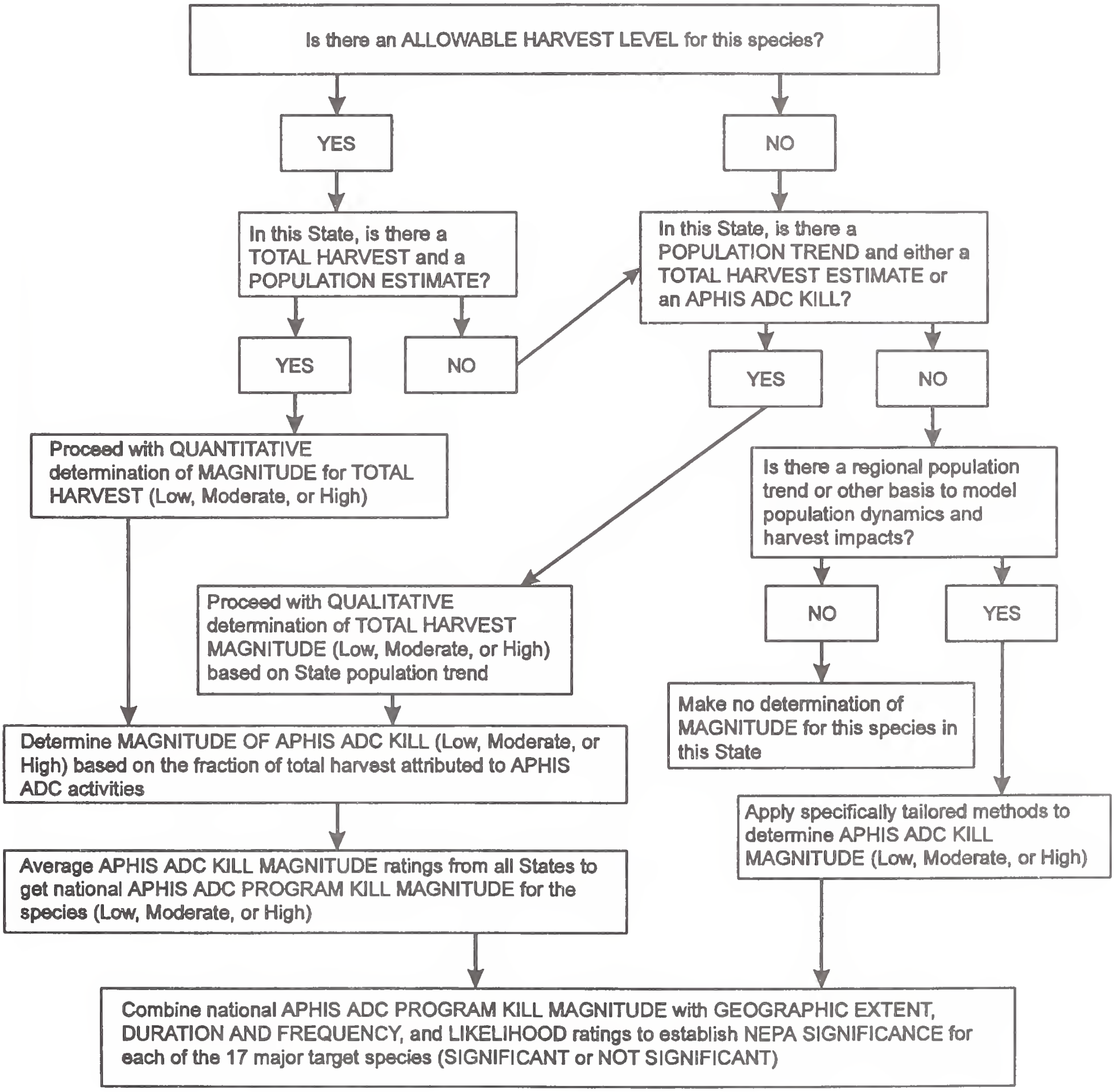
[i] Fritzell 1987.

[j] Ashman et al. 1983.

[k] Sanderson 1987.

[l] These values represent the percentage harvestable under low-to-high fecundity rates.

Figure 4-1 **Procedures for Evaluating APHIS ADC Program Impacts on Abundance of Major Target Species**



In using these magnitude criteria, it is recognized that allowable harvest levels for any species can vary in different situations. Variations in habitat quality, climate, and other environmental features cause density, reproductive success, and mortality to differ among populations. Because of these differences, some populations may support higher harvests than others. Any given harvest level may produce stability for some populations of any species but increases or decreases in other populations.

Criteria for Qualitative Determinations

When an allowable harvest level is unavailable for a species, the magnitude rating for total harvest is based solely on State population trends. The use of population trends as an index of magnitude is based on the assumption that annual harvests do not exceed allowable harvest levels. State wildlife management agencies act to avoid overharvests by restricting hunting and trapping to ensure that annual harvests are within allowable harvest levels.

The criteria for judging total harvest magnitude on the basis of animal population trends are as follows:

- If the population is increasing, the magnitude is considered low.
- If the population is stable, the magnitude is considered moderate.
- If the population is decreasing, the magnitude is considered high.

For purposes of this analysis, when a State reports overlapping population trends (e.g., increasing or stable, stable or decreasing), magnitude ratings are based on the most conservative trend. For example, a trend reported as increasing or stable translates to a magnitude rating of moderate. Magnitude determinations are not made for States in which information on population numbers or trends are unavailable.

APHIS ADC kill magnitude is rated only for those species and States where total harvest magnitude is rated. For both quantitative and qualitative determinations, APHIS ADC kill magnitude is based on the fraction of total harvest attributed to APHIS ADC program activities. Magnitude ratings for the APHIS ADC kill are based on the following criteria:

- If APHIS ADC kill is less than or equal to 33 percent of the total harvest, the magnitude is considered low.
- If APHIS ADC kill is greater than 33 percent but less than or equal to 66 percent of the total harvest, the magnitude is considered moderate if the total harvest rating is high, or low if the total harvest rating is moderate.
- If APHIS ADC kill is greater than 66 percent of the total harvest, the magnitude is considered equivalent to the total harvest rating.

The APHIS ADC kill magnitude cannot exceed total harvest magnitude because the APHIS ADC kill is only a portion of the total harvest. APHIS ADC kill magnitude and total harvest magnitude are equal when the APHIS ADC kill constitutes more than 66 percent of the total harvest.

When APHIS ADC kill magnitude ratings for each species have been completed for as many States as possible, the ratings are assigned numeric values of one, two, or three for each rating of low, moderate, or high, respectively. The national magnitude rating for APHIS ADC kill is then determined for each species by the average of assigned values. The national magnitude rating is low when the average is less than 1.5, moderate when the average is greater than or equal to 1.5 but less than 2.5, and high when the average is equal to or greater than 2.5.

The preceding procedures are used for 14 of the 17 major target species. However, special qualitative procedures are used for blackbirds, starlings, and cattle egrets because there is no allowable harvest level. Regional population trends and a blackbird

population model are used to determine magnitude for the blackbird group and starling. The magnitude determination for the cattle egret is based on regional population trends. These procedures are explained in the sections that address those groups.

National magnitude ratings for the 17 major target species are listed in Table 4-31.

(b) Geographic Extent

Geographic extent of APHIS ADC program impacts is analyzed according to the percentage of States within a species' range in which the species was killed. Therefore, the geographic extent of impacts was quantified at the national level.

Animals were killed by the APHIS ADC program in 34 States in FY 1988. Table 4-3 presents the geographic extent of the APHIS ADC program kill for selected target species, regardless of numbers taken in each State. For purposes of this EIS, the geographic extent of the program kill is divided into three arbitrary levels as follows:

- If the program kills a species in less than 34 percent of the States in its range, the effect is considered of low extent.

Table 4-3

Geographic Extent of APHIS ADC Program Kill of Selected Target Species in FY 1988

Species	Number of States in Species Range	Number of States in Which APHIS ADC Killed Species	Percent of Range (By State) in Which Species Was Killed	Level of Extent[a]
Badger	25	16	64	moderate
Black bear	30	9	30	low
Bobcat	47	13	28	low
Coyote	48	22	46	moderate
Gray fox	46[b]	7	15	low
Red fox	48[c]	15	31	low
Mountain lion	15[d]	11	73	high
Opossum	43[e]	10	23	low
Raccoon	48	23	48	moderate
Striped skunk	48	19	40	moderate
Beaver	49	19	39	moderate
Nutria	14	4	29	low
Porcupine	44[f]	13	30	low
Prairie dog	12	4[g]	33	low
Blackbird group	49	9	18	low
Cattle egret	43	2	5	low
European starling	49	7	14	low

[a] The impact is of low, moderate, or high extent depending on whether a species is killed in less than 34 percent, 34 to 66 percent, or more than 66 percent of the States in its range.
[b] Limited ranges in MT, WY, NE, and KS are included in total.
[c] Limited ranges in AZ and CA are included in this total.
[d] Limited range in FL is included in this total.
[e] Isolated populations in AZ and CO are included in this total.
[f] Limited ranges in MO, NC, AL, and GA are included in this total.
[g] The number of prairie dogs confirmed killed was reported for three States, but areas in another State also received federally supervised treatment for prairie dog damage control.

- If the program kills a species in 34 to 66 percent of the States in its range, the effect is considered of moderate extent.
- If the program kills a species in more than 66 percent of the States in its range, the effect is considered of high extent.

(c) Duration and Frequency

In addition to magnitude and geographic extent, impacts of wildlife control also are considered in terms of duration and frequency of the impact. Duration refers to how many years the control activity has been or could be in operation. Frequency refers to the distinction between continual or intermittent control activities. Continual refers to control actions that occur regularly throughout the year. Intermittent refers to actions that occur sporadically or infrequently throughout the year. The evaluation criteria for duration and frequency are as follows:

- Low duration and frequency is assigned only if a few individuals of a species were killed in FY 1987 or FY 1988 and this species is not expected to be killed each year in the future. Animals may be killed every year, but only intermittently.
- Moderate duration and frequency is assigned if individuals of a species were killed periodically in FY 1987 and FY 1988 and this species is expected to be killed each year in the future. When damage is severe, killing is expected and may occur during critical times, but not continually.
- High duration and frequency is assigned if individuals of a species were killed over a number of years and are expected to be killed in the future. Year-round lethal measures are expected to continue because the damage problem is not expected to dissipate. Alternatively, animals may not be killed year round but may be killed on a seasonal basis every year.

For all 17 species undergoing detailed analysis, the duration and frequency component of the impact evaluation is ranked high. As stated previously, the 17 species were chosen because they are regularly killed by the APHIS ADC program. Because duration and frequency is high for all 17 species, this factor is treated uniformly for all of the species without further analysis.

(d) Likelihood

APHIS ADC program impacts also are assessed by likelihood that killing will occur. As long as depredation or damage continues, the likelihood of control actions occurring is high. When an event is unpredictable or accidental, then the likelihood factor is moderate or low, respectively. The likelihood component of the impact evaluation in this EIS is ranked high nationally for all 17 target species undergoing detailed analysis. Because this factor is the same for all 17 species, it also is treated uniformly without further analysis.

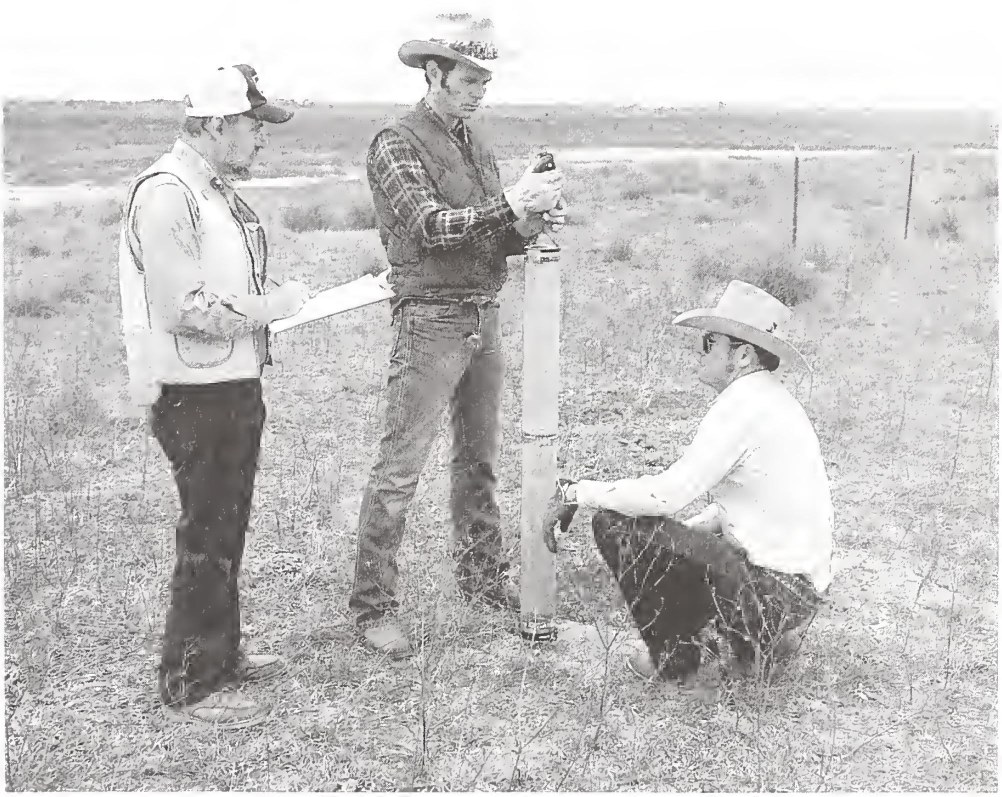
(3) Impact Rating

Evaluation of the impacts of killing the 17 target species, based on the four factors described previously, relates to estimated population size of these species in each State. Local impacts on target species may be substantial if lethal control is applied intensively, even if overall impacts are not determined to be significant. In some cases, an intended measure of protection may not be achievable without local impacts on the abundance of certain species. This is an intrinsic aspect of such damage control. The impacts may be either temporary or long term, depending on the specific local activity. However, local populations may rebuild by natural reproduction and immigration if the control actions stop, except in very isolated situations where eradication is achieved. In isolated populations, eradication of selected species may be the goal of the APHIS ADC program. In such cases, program activities may impact species diversity.

Impacts on target and nontarget species are grouped according to the type of crop, livestock, or facility that the APHIS ADC program protects from wildlife damage. If a certain species causes damage to many resource types (as is often the case) and the current control methods used are the same, then the types of impacts or potential impacts are similar and are discussed only once. Each species is discussed under the resource for which damage was most frequently reported in FY 1988. The numbers of individuals killed (by species) and the methods used for each State where the APHIS ADC program killed animals in FY 1988 are presented in Appendix H. The national significance of APHIS ADC program kills for all 17 species is discussed later in this chapter.

Much of Chapter 4 is devoted to an analysis of whether the harvest by APHIS ADC constitutes a significant impact upon abundance and diversity of target populations. This emphasis is appropriate because program impacts on animal populations are greater for target species than nontarget species. The methods used by APHIS ADC are designed to be selective for target species and, therefore, are assumed to remove higher proportions of target than nontarget species populations.

A major exception to this assumption, however, is the group of nontarget species protected by the Endangered Species Act (T&E species). As defined by the Act an impact to even one individual of the species could constitute an unacceptable impact. As this type of potential impact is of concern, the following section presents in some detail the approach taken for evaluating and identifying potential biological impacts to nontarget species, with particular reference to T&E species.



ADC personnel field test the pull force needed to discharge an M-44 sodium cyanide ejector.

b. Impacts of Control Methods

Wildlife damage control methods may be employed via three strategies or action approaches: resource management, physical exclusion, and wildlife management (Table 2-4, and Appendix J). Nonchemical methods are included in each of these approaches; chemical methods are limited to the wildlife management approach. The majority of APHIS ADC direct control efforts are directed at wildlife management activities including the use of habitat management techniques, frightening devices, and relocation and lethal methods. The APHIS ADC program uses a variety of chemical and nonchemical methods to control wildlife damage problems. A comprehensive assessment was conducted of the potential risks associated with APHIS ADC's use of various control methods. The findings of the assessment in terms of risks to nontarget animals, APHIS ADC employees, and the general public are described fully in Appendix P. This section discusses the potential impacts of wildlife damage control methods used by APHIS ADC and focuses on potential impacts to nontarget species.

Program data from six representative States for 1988 indicate that of the nonchemical methods, the greatest adverse impacts are unavoidable losses of some nontarget animals as a result of accidental captures (Appendix P). The percentage of nontarget animals that were inadvertently destroyed as a result of being captured (percent of total captures) ranged from 0 to approximately 17 percent. Negative impacts were greatest for leghold traps and snares with nontarget loss rates of 14 and 17 percent, respectively. Nontarget loss rates for other methods were approximately 2 percent or less. These data are demonstrative of impacts to individual nontarget animals; however, the impacts on the 40 species directly affected were minimal. Additionally, the numbers killed were low in relation to the total abundance and wide geographic distribution of these species. As with target species, there may be locally significant, short-term impacts.

Chemical methods of control constitute only a fraction of the lethal and nonlethal methods used under the APHIS ADC program's IPM approach. The level of detail presented in this EIS for these chemical control agents, including the use of quantitative risk assessment (presented in detail in Appendix P) as a means of determining potential impacts, is not intended to reflect an emphasis by the APHIS ADC program on the use of this type of control. It reflects instead the importance of the issue as identified during public scoping and based on public comments. The significance of potential biological impacts of chemical control methods is determined using several approaches, including the use of quantitative risk assessment, all of which use the same criteria for evaluating program impacts (magnitude, geographic extent, duration, likelihood), and all address impacts on abundance and diversity of species. It is noted that other agencies have independently evaluated potential biological impacts of some APHIS ADC pesticides (e.g., USFWS 1979, 1991; USEPA 1980, 1983a, 1983b, 1991b). In addition, the USFWS Office of Endangered Species, in its Biological Opinions related to the APHIS ADC program, has evaluated potential impacts of these methods on federally listed T&E species (USDI 1979, 1982, 1989a, 1992a). The conclusion and recommendations included in the Biological Opinions will take precedence over those provided in the ADC Risk Assessment. Appendix F provides a summary of listed wildlife species potentially affected by APHIS ADC chemical control methods, together with the July 1992 USFWS Biological Opinion on the APHIS ADC program.

The following discussion details the basis from which biological impacts, including those on human health, of current APHIS ADC chemical control methods were evaluated. Chemical methods used or recommended by APHIS ADC in direct control or technical assistance include several dozen pesticide products, each of which is required to satisfy appropriate registration requirements, administered by USEPA as prescribed under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). Table 4-4 lists the active ingredients (a.i.) in chemical methods used or recommended by the APHIS ADC program during FY 1988 through 1991.

Table 4-4

Technical or Common Names of Active Ingredients in Chemical Methods Recommended or Used by the APHIS ADC Program During FY 1988 through 1991[a]

Alpha-chloralose (bird immobilizer)
Aluminum phosphide (Phostoxin, Fumitoxin, Detia-Rotox)
4-Aminopyridine (Avitrol)
BGR (Big Game Repellent)[b]
Bone tar oil (Magic Circle deer repellent)
Brodifacoum (Weather Blok)
Bromethalin[b]
Chlorophacinone[b]
Cholecalciferol
Compound PA-14 (Tergitol)
Diphacinone[b]
DRC-1339
Fenthion (Rid-a-Bird; BCF #1)
Glyphosate
Hinder (repellent)[b]
Immobilizing/euthanizing agents (Ketaset, Buthanasia-D, Rompun)
Mesurol[b]
Mineral oil
Ornitrol[b]
Pivalyn[b]
Polybutene (Eaton's 4 the Birds)
Sodium cyanide
Sodium fluoroacetate (Compound 1080)
Sodium nitrate (gas cartridges)
Strychnine
Warfarin[b]
Zinc phosphide

[a] "Recommended" refers to APHIS ADC technical assistance; "Used" refers to APHIS ADC direct control activities.

[b] These chemicals were recommended in technical assistance but not used in direct control by APHIS ADC during FY 1988 through FY 1991.

(1) Overview of Chemical Methods Risk Assessment

Due to the importance of chemical methods to the overall APHIS ADC program, it was necessary to adopt a quantifiable, widely accepted approach to evaluating potential impacts associated with the application of chemical methods. **Quantitative risk assessment** is such an approach, currently practiced by diverse scientific and regulatory communities in evaluations requiring characterization of potential impacts of pesticides or other chemical compounds. The risk assessment paradigm used is widely accepted and promotes comparability and reproducibility (NAS 1983). It consists of three generalized components, including **exposure assessment**, **toxicological evaluation**, and **risk characterization.** This approach, presented in detail in Appendix P, is a frequently employed tool for risk assessment characterization.

The chemical risk assessment is based exclusively on the **direct control** chemical agents (pesticides) used by APHIS ADC during FY 1988 through 1991. These agents were evaluated due to an important distinction between chemical methods actually used for direct control and those for which only technical assistance was offered. APHIS ADC does not monitor or regulate use of chemicals by personnel not employed or supervised by APHIS ADC. Therefore, use statistics necessary for this risk assessment were not available for pesticide uses that may have resulted from APHIS ADC technical assistance activities. However, the potential environmental consequences of materials used in technical assistance are not expected to differ significantly from those of the same products used in direct control because all users are required to comply with label specifications. Also, the most environmentally significant APHIS ADC program chemical uses occur in direct control. A measure of protection against exposures to nontarget species is presumed simply by complying with label specifications; it is APHIS ADC policy to use or recommend only chemical methods which have been registered by USEPA or other appropriate regulatory agency (ADC Directive 2.401).

The risk assessment examines nontarget effects potentially associated with APHIS ADC program uses of chemical methods in direct control. Its emphasis is upon potential effects to wildlife, including species designated as T&E under the Endangered Species Act of 1973, as amended, as these animals represent the most sensitive populations. The risk assessment also considers potentially exposed humans such as recreational receptors (e.g., hunters, hikers), residential receptors (e.g., local residents), and occupational receptors (e.g., pest control operators). These workers, ostensibly the single most exposed group, are adequately protected by provisions within FIFRA, in addition to more generalized protection under the Occupational Safety and Health Act (OSHA).

The risk assessment was:

- Partially based on known use pattern data and observed nontarget effects (e.g., reported take);
- Designed to make predictions and estimates concerning the potential for the occurrence of nontarget hazard or risk based on estimates of exposure and toxicity.

The risk assessment makes the assumption that current use patterns would continue as they have during FY 1988 through 1991. It differs from a safety or hazard evaluation in that they normally are performed solely on a retrospective basis, emphasizing observed impacts from past exposures.

The intent of FIFRA is to ensure that the benefits of pesticide use not be outweighed by potentially adverse environmental effects. Accordingly, a primary objective of USEPA's registration procedure is to require evaluation of potential environmental hazards associated with product use to help weigh the effect of approving or denying registration against the effect on reduced food production, increased prices, or impacts to other protected resources. All chemical methods evaluated in the risk assessment have satisfied or will satisfy these registration requirements. The risk assessment, however, goes further than

USEPA's registration process in that it addresses potential exposures not considered under FIFRA or other registration requirements and evaluates the potential for nontarget exposures on a toxicological basis.

(2) Information Sources

Information related to all chemicals used by the APHIS ADC program during FY 1988 through 1991 was collected from a number of sources (detailed in Appendix P), including APHIS ADC program State annual reports, Pocatello Supply Depot (PSD) records, APHIS ADC registration archives, product labels, the scientific literature, and other sources. A questionnaire was sent to each APHIS ADC State Director requesting detailed information on State-specific use patterns, nontarget exposures, take or kill data, and other key information relating to each chemical method used in direct control.

These data were used in part to develop summaries of specific use-pattern data for all direct control methods, as shown on Table 4-5. These data, critical to the accuracy and effectiveness of the risk assessment, were directly incorporated into both major components of the risk assessment (screening procedure and the risk assessment itself). This table includes the following information for each active ingredient:

- Product name
- USEPA (or other) registration number
- Description of the formulated product(s)
- The maximum annual application rate and frequency during 1988 - 1991
- States where applied
- The maximum quantity of annual use for the active ingredient
- The seasonal pattern of use
- The target species and resources to be protected, and
- Representative potential nontarget species (indicator species).

USEPA-approved labeling for ADC-registered direct control products is provided in Appendix Q. Several of the direct control chemical methods were used for experimental use purposes only during FY 1988 through 1991. These materials were addressed in the risk assessment identically to the other registered compounds.

Table 4-6 shows the amounts of pesticide products shipped from the APHIS ADC Pocatello Supply Depot to program offices located within the United States as well as other locations for use in direct control and technical assistance. These quantities can be compared with the maximum quantities applied during a given target year for direct control (Table 4-5). The amounts do not agree because substantial quantities of pesticides were shipped to users outside the APHIS ADC program. In addition, products shipped from PSD are not always used in the year of shipment, and PSD is only one of many product sources for APHIS ADC field offices.

Product labels played a key role in the risk assessment due to the expressed provision under FIFRA that it is a violation to use a pesticide "in a manner inconsistent with its labeling." In other words, the risk assessment was designed to address potential nontarget effects when the material is applied in strict accordance with label specifications. This is a critical point in formulating conclusions, because it aids in determining recommendations for additional mitigation measures when potential hazards (identified by the risk assessment) occur even when label specifications are strictly followed. Thus, conclusions were formulated assuming strict adherence to label specifications, and additional mitigation measures were recommended when nontarget hazards were identified.

Table 4-5

Chemical Methods Used by APHIS ADC for Direct Control During FY 1988 through FY 1991–Specific Use Pattern Data

A.I./Product Name	Registration Numbers	Formulation	Maximum Application Rates	Maximum Application Frequency
Avicides & Other Agents				
Alpha-chloralose for Bird Capture	INAD6602	99.50%	1 bait/bird	
4-Amino-pyridine (Avitrol)	11649-1,-4,-6,-7	0.5% on grain	ratio of 1 part treated to 5 parts untreated	4 times per site per year [a]
4-Amino-pyridine (Avitrol)	11649-10	25% on bread		
DRC-1339 (feedlots)	56228-10	98%	4 g (a.i.) per 100 m^2	once/year per site
DRC-1339 (structures)	State labels [b]	98%	25 lbs/acre of 0.5% a.i.	twice/year per site
DRC-1339 (staging areas)	State labels	98%	100 lbs/acre (0.5% a.i.)	twice/year per site
DRC-1339 (gull toxicant)	56228-17	98% powder	110 mg a.i. (5 baits) per gull	10 bait applications per colony per year
DRC-1339 (eggs/meat bait)	State labels and EUPs [b]	98% powder	3.5 g a.i. per site	twice/year per site
DRC-1339 (Starlicide Complete)	602-136	0.1% grain bait	50 lbs/acre	maximum of 3 days
Fenthion (BCF #1)	State label	9% solution	NA	once/year per site
Fenthion (Rid-a-Bird)	7579-2	11% solution	1 oz per perch	once/year per site
Mineral Oil	State EUP			
Glyphosate (Rodeo)	524-343	53.8%	198 oz/acre	once/year per site
Compound PA-14 (Tergitol) [c]	56228-13	99.50%	20 gal/acre of a.i.	twice/year per site
Polybutene (Eaton's 4 the Birds)	8254-1-56	paste (80% a.i.)	10.5 fl oz per 10 ft of roost	
Pigeon Bait Strychnine Corn [d]	56228-08	0.40%	5 qts per site	once/year
Strychnine (Sparrow Cracks) [d]	8612-30	grain bait (0.6%)		once/year
Strychnine Bird Toxicant [d]	9561-2	0.35%		once/year

(Continued)

States Where Used	Maximum Annual Use (A.I.)	Seasonal Use Distribution % by sp/su/f/w	Target Species or Species Group(s)	Resource(s) Protected	Representative Potential Nontarget Species
AL, CA, MI, NM, NV, OH, OK	100 grams	not fall	Canada geese, coots, ducks	HH&S, turf, nuisance	gulls, geese, house sparrow
HI, ID, KY, NJ, NM, NC, OK, KS, TN, TX, VT, WA, WV	1.4 lbs	all year	sparrow, pigeons, gulls, blackbirds, starlings	HH&S , livestock feed, property, cattle	mourning dove, savannah sparrow, eastern meadowlark
TN, KY	0.088 lb	all year	gulls	HH&S and property	none
AZ, GA, ID, MS, NM, NV, OR, UT, VT, WV, WA	115 lbs	0/20/40/40	starlings, blackbirds, pigeons, grackles, crows	apples, property, feedlots, HH&S, equipment	dark-eyed junco, mourning dove, blue jay, cardinal
IN, KY, TN, GA, IL, NM, MI	11.2 lbs	0/0/10/90	starlings, pigeons, crows	HH&S, property, grain, feed	mourning dove
LA, ND, TX	22 lbs	except summer	blackbirds, pigeons, grackles	sprouting rice, sunflowers, property, fruit	blue jay, dark-eyed junco, meadowlark, mourning dove
ME, MA	1.1 lbs	spring only	great black-backed and herring gulls	Arctic, common, and roseate terns	none
AZ, CA, ID, NM, NV, OR, UT	1.5 lbs	all year	raven, crows, magpies	livestock, endangered species, geese, grain, HH&S, waterfowl	opossum, raccoon, striped skunk, coyote
NJ, WA	1.17 lbs	fall and winter	starlings, blackbirds	cattle, feed, HH&S	cardinal, meadowlark
HI	0.09L	all year	mynah	HH&S	house finch
KY	0.9 gal	all year	pigeons	HH&S, property	house sparrow, house finch
WA	15 gal	100/0/0/0	gull, ring-billed	HH&S, property	none
ND, SD	355.6 gal	summer only	cattails for reducing blackbird habitat	sunflower	other wetland birds: American bittern, VA rail, wrens, sparrows
KY, MS, TN	715 gal	winter only	blackbirds, starlings	HH&S, property, resources	robin, dark-eyed junco, cardinal, sparrow, bobwhite, others in roost
HI	50.4 oz	25/25/25/25	pigeons	HH&S	none
LA, TX	0.24 lb	all year	pigeons	HH&S, equipment, property	domestic dog, great horned owl, gull, ducks, meadowlark
TX	0.03 lb	25/25/25/25	house sparrow	property, equipment	
TX	0.001 lb	100/0/0/0	grackle, blackbird	fruit, crops	

(Continued)

Table 4-5 (Continued)

Chemical Methods Used by APHIS ADC for Direct Control During FY 1988 through FY 1991–Specific Use Pattern Data

A.I./Product Name	Registration Numbers	Formulation	Maximum Application Rates	Maximum Application Frequency
Rodenticides				
Aluminum Phosphide (Phostoxin, Detia-Rotox, Fumitoxin)	40285-1, 2548-69, 5857-1	3 g tablet, 55% - 57%	4 tablets/burrow	twice/year per site
Brodifacoum (Weather Blok)	10182-48	0.005%	23 bloks/15 ft at 20 g/blok	continuous 15 days
Cholecalciferol (Quintox)	12455-39, and State EUP	0.075%	8 oz bait/15 ft	continuous 10 days
Sodium Nitrate (gas cartridge for rodents)	56228-2	43.36% 85 g/cart.	1 cartridge per burrow	
Strychnine (Strychnine milo)[d]	56228-11; 56228-19	0.35%	10 lbs/acre; 1 lb/acre	once/year
Strychnine (steam-rolled oats)[d]	56228-12; 56228-20	0.50%	10 lbs/acre; 1 lb/acre	once/year
Strychnine[d]	56228-27; State labels	1.6% paste	1 gal/16 lbs bait, 1 cup/placement	
Strychnine[d]	State labels	4.9% paste	16 g/quart bait (0.31% a.i.)	
Strychnine, 5.79%, salt block[d,e]	56228-04	5.79% wood block	1 block/tree	once/year
Zinc Phosphide Concentrate for Mouse Control	56228-6; State EUP	63% powder	4 g/quart bait	once/month
Zinc Phosphide Concentrate for Muskrat and Nutria Control	56228-9	63% powder	4.8 Kg (a.i.) per square mile	once/month
Zinc Phosphide Concentrate for Rat Control	56228-7	63% powder	4.5 g (a.i.) per lb. of bait	once/month
Zinc Phosphide on Steam-rolled Oats	56228-5,14,18 and State labels	2% oats	10 lbs/acre	1 application per year
Zinc Phosphide (ZP Rodent Bait AG)	12455-17	2% oats	20 lbs/acre	1 application per year

(Continued)

States Where Used	Maximum Annual Use (A.I.)	Seasonal Use Distribution % by sp/su/f/w	Target Species or Species Group(s)	Resource(s) Protected	Representative Potential Nontarget Species
NE, OK, OR, NM, TX	450 lbs	all year	gopher, prairie dog, mole, squirrel, voles, marmots	rangeland, alfalfa, turf, field grain, dikes, property	cottontail rabbit, deer mice, other animals inhabiting burrows
HI (Am. Samoa)	0.002 lb	all year	Polynesian rat	green sea turtle, hawk bill turtle, marine birds	none
VT	0.021 lb	spring and summer	chipmunks, mice, squirrels	maple sap	rabbits, hares, skunks
CA, ID, IN, KY, LA, MN, ND, NE, NM, OH, OK, OR, TN, TX, WV	303 lbs	all year	ground squirrels, gophers, marmots, woodchucks, prairie dog	CA least tern, crops, turf, pastures, structures, HH&S	cottontail rabbit, deer mice, burrowing owl, other animals inhabiting burrows
NE, NM, OR, TX	3.1 lbs	all year	pocket gopher, ground squirrels	rangeland, grain, alfalfa, turf, fruit, property	blackbirds, horned lark, mourning dove, sparrows, bald eagle, coyote, domestic dog
NE, NM, OR	38.6 lbs	all year	prairie dog, gophers, ground squirrels	rangeland, crops, property, trees	short-eared owl
ID	0.1 lb	20/0/0/80	hares, jackrabbits	alfalfa, beans	deer mice, voles, deer
ID, WA	3.44 lbs	spring and summer	marmot, woodchucks	grains, beans, pasture, alfalfa, sugar beets, berries	deer mice, voles, deer
OR	0.81 lb		porcupine	standing trees	deer mouse, northern flying squirrel, chipmunk, rabbit
ID	2.52 lbs	spring only	marmots	beans, grains, sugar beets, alfalfa, pasture	deer mouse, voles, livestock
LA, TX, TN	0.2 lb	all year	nutrias, muskrats	lawn, dikes, turf, pets, natural resources	potential hazard to raccoon, beaver; secondary hazard: domestic dogs/cats
TX, NM, VA, WV, NE	0.9 lb	all year	black rats, Norway rats	HH&S, property, poultry, livestock feed	potential hazard; domestic animals, feral cats
NE, ND, NM, OK, VT	366 lbs	all year	prairie dogs, squirrels, mice, chipmunks	pasture, crops, alfalfa, turf, maple sap	cottontail rabbits, deer mice, horned lark, pheasant, turkey
ND	0.04 lb	0/75/25/0	ground squirrels	grain crops	mammals; secondary hazard to domestic cats/dogs

(Continued)

Table 4-5 (Continued)

Chemical Methods Used by APHIS ADC for Direct Control During FY 1988 through FY 1991—Specific Use Pattern Data

A.I./Product Name	Registration Numbers	Formulation	Maximum Application Rates	Maximum Application Frequency
Zinc Phosphide (D&H Formula Rodent Rid-R)	2393-185-41937	2% oats	10 lbs/acre	1 application per year
Zinc Phosphide (ZP Rodent Bait)	12455-18	2% pellets		1 application per year
Zinc Phosphide on Wheat	56228-3	1.82% wheat	10 lbs/acre	1 application per year
Predacides & Other Agents				
Bone Tar Oil (Magic Circle deer repellent)	4704-3	93.75%	2 gal/ 2 acre (perimeter)	3 times monthly
Sodium Cyanide (M-44 Cyanide Capsules)	56228-15	88.62% (0.91 g/cap)	10 M-44 per 100 acres	1 capsule/M-44 week
Sodium Fluoroacetate, Compound 1080 (livestock protection collar)	56228-22; 46779-1	1 04% liquid	30.4 g/collar	1 collar/acre/week [g]
Sodium Nitrate (gas cartridge for coyotes)	56228-21	65% a.i. at 240 g	1 cartridge/burrow	once per year
Immobilizations/euthanizing agents (Ketaset, Beuthanasia-D, and Rompun)			1 dose per animal	once/animal

[a] Based on personal communication with APHIS ADC State directors in OK and KY.

[b] Registration numbers for experimental use permits (EUPs) and "State labels" (State and local need registrations: FIFRA Section 24(c)) are provided in Appendix Q.

[c] USEPA registration of this product was canceled in 1992.

[d] All above-ground uses of strychnine were suspended in 1988. Above-ground strychnine uses reported in this table occurred prior to the suspension.

[e] USEPA registration of this product was voluntarily withdrawn by APHIS ADC in 1989.

[f] Maximum annual use is based on amount of NaCN in capsules shipped from Pocatello Supply Depot. The number of capsules actually used is smaller.

[g] Based upon assumed maximum 20 collars in 20-acre pasture. For different scenarios and use restrictions on collar numbers, see technical bulletin (Connolly 1991).

[h] This amount was actually released into the environment, based on lost or punctured collars.

States Where Used	Maximum Annual Use (A.I.)	Seasonal Use Distribution % by sp/su/f/w	Target Species or Species Group(s)	Resource(s) Protected	Representative Potential Nontarget Species
OR	133.5 lbs	75/25/0/0	ground squirrels, pocket gophers, voles	ditches, pastures	mammals; secondary hazard to domestic cats/dogs
NM	11.9 lbs	75/25/0/0	kangaroo rat	pasture, dikes, buildings	
KY, OR, TN	19.7 lbs	all year	voles, house mice	HH&S, property, trees, fruit	
NH	0.117 g	0/100/0/0	white-tailed deer	trees	
AZ, CA, CO, ID, LA, MT, ND, NE, NM, NV, OR, OK, , SD, TX, UT, WY, WA	220 lbs [f]	all year	coyote, red fox, gray fox, wild dog	livestock, poultry	badger, fox, ringtail cat, skunk, vulture, opossum, raccoon, black bear, bobcat
TX	0.05 lb [h]	20/35/30/15	coyote	sheep, goats	golden eagle, skunk, domestic dog, turkey vulture
CA, CO, ID, MT, ND, NE, NM, NV, OR, OK, TX, UT, WA, WY	1,114 lbs	spring and summer	coyote	livestock, poultry, geese, watermelons	potential hazard: other animals inhabiting active coyote den
NE, NH, TX	< 24 oz (15 uses)	all year	skunk, raccoon, ferret, black bear, opossums	HH&S, property	none

Table 4-6

Amounts of Pesticide Products Shipped from the USDA APHIS ADC Pocatello Supply Depot to APHIS ADC Program Offices and Other Locations within the U.S. for Use in Direct Control and Technical Assistance[a]

Chemical Name (a.i.)	Product Name (Registration Number)	Units	Quantities Shipped 1988	1989	1990	1991
DRC-1339	DRC-1339 Concentrate (56228-10)	pounds	47	140	109	171
Sodium Cyanide	M-44 Cyanide Capsule (56228-15)	1000s	89	101	101	94
Sodium Nitrate/charcoal	Gas Cartridge for Rodents (56228-2)	1000s	1,099	1,167	1,280	938
	Gas Cartridge for Coyotes (56228-21)	each	2,200	3,200	2,750	5,225
Strychnine	Porcupine Block Strychnine-Salt Mixture (56228-4)	each	858	0	0	0
	Pigeon Bait (56228-8)	pounds	220	0	0	0
	Grain Bait (0.35%) (56228-11)	pounds	7,085	12,765	16,375	22,200
	Grain Bait (0.35%) (56228-19)	pounds	6,755	7,600	6,820	7,345
	Grain Bait (0.5%) (56228-12)	pounds	31,765	14,384	18,750	11,150
	Grain Bait (0.5%) (56228-20)	pounds	14,820	16,868	32,660	32,815
	4.9% Paste (56228-ID-1)	pounds	71	0	3	0
Zinc Phosphide	2% ZP Wheat (56228-3)	pounds	1,325	1,310	83,575	62,595
	2% ZP Field Mouse Bait (56228-5)	pounds	600	720	2,200	2,540
	2% ZP Grain Bait (56228-14)	pounds	33,130	59,490	46,080	74,785
	63% Concentrate for Mice (56228-6)	pounds	2,128	492	1,336	36
	63% Concentrate for Rats (56228-7)	pounds	23	0	15	23
	63% Concentrate for Muskrats and Nutria (56228-9)	pounds	0	2	7	3

[a] In addition to products shipped from PSD, APHIS ADC program offices procured several other commercial products and distributed them in a technical assistance mode for application by others. In 1988, these distributions included 1,070,679 aluminum phosphide tablets, 10 pounds of Avitrol, and 2,715 pounds of anticoagulant rodenticide products.

Use-pattern information played a key role in the risk assessment. It is acknowledged, for example, that even a small quantity of a highly toxic active ingredient released into the environment could have a significant effect upon a nontarget receptor. Accordingly, the risk assessment was conducted solely on the basis of quantities potentially released as a part of an **individual application**, at the maximum label-specified rate, rather than simply to address the total amount of material applied during any of the target years (considered only as part of the screening process). This is the most meaningful approach to evaluating impacts because it addresses potential nontarget exposures encountered at a site of application even when total quantities released may be small.

It therefore follows, and represents a fundamental assumption to the impacts assessment, that if no individual application causes a potentially adverse nontarget exposure, then the total quantity of active ingredient released into the environment by APHIS ADC on a programmatic level is negligible as well. This concept is further discussed in the discussion of cumulative impacts.

(3) Chemical Methods Risk Assessment Approach and Methodology

This section provides a brief overview of the approach used in the chemical methods risk assessment, the details of which are provided in Appendix P. The risk assessment process followed a specific sequence, which consisted of:

- Collecting key information on the chemical control methods used by APHIS ADC for direct control, including use pattern, potential nontarget receptors, and compound-specific environmental fate and toxicological properties.
- Using this information to conduct a first tier or "critical element" screening, which was used to identify products that when used properly produce no probable risk; those methods screened out were documented and not subjected further to the risk assessment process.
- Conducting a more detailed and rigorous screening procedure, consisting of a scoring process for each remaining chemical method, which screened out additional products that when used properly produce no probable risk; those methods screened out were also documented and not subjected further to the risk assessment process.

All of the remaining chemical methods were subjected to quantitative risk assessment. The remaining steps applying to these methods included:

- Analyzing each remaining product on the basis of off-site transport potential, which produced an additional list of products found to have **minimal off-site transport potential**; these methods were analyzed for on-site exposure potential only.
- Developing a representative exposure scenario, using appropriate indicator species, for all remaining methods, conducting quantitative exposure assessments, and conducting sensitivity/uncertainty analyses for those materials found to have significant off-site transport potential.
- Conducting the risk characterization, using appropriate indicator species, for those materials found to have significant off-site transport potential.
- Comparing these findings with independently derived conclusions for Threatened or Endangered species, representing the most sensitive animal populations.
- Using these findings to form the basis for deriving conclusions and identifying potential mitigation measures for the APHIS ADC program.

Figure 4-2 graphically depicts the process described above for the chemical methods risk assessment process. The tiered approach was adopted to maximize the effectiveness of the analysis, as each tier involved increasing levels of rigor and detail designed to screen out those chemicals not likely to require more detailed analysis due to a lower likelihood of causing an effect. For each tier, if a **no-probable risk** designation was made, the logic

for that decision for each formulated product was documented, and no further analysis was performed. The intent of the approach was to reduce to the extent possible the likelihood that a potentially harmful product could erroneously be removed from further analysis. Table 4-7 shows the critical element designations and scores for each product screened and scored. All products exceeding the cumulative score of 34 were subjected to more rigorous quantitative risk assessment.

All phases of the chemical methods risk assessment were conducted on the basis of the **formulated products** rather than **active ingredients**, although basic active ingredients properties were considered in the analysis.

Table 4-8 lists the potentially affected T&E species considered in the risk assessment. Tables 4-9 and 4-10 show key environmental fate and toxicological properties, respectively, for each active ingredient considered in detail in the risk assessment. Table 4-11 lists key numerical exposure parameters utilized as part of the quantitative exposure assessment. These parameters were developed for each indicator species, also shown on Table 4-11, used to represent potentially affected wildlife communities and to calculate Hazard Quotient (HQ) values. HQ values are a measure of the potential hazard associated with a product. The HQ value is derived by dividing the exposure by the toxicity, where both are expressed as a dose. The HQ value is a way of standardizing the measure of hazard to increase the consistency of analysis.

(4) The Role of Use Pattern in Determining Chemical Methods Impacts

The chemical methods risk assessment assists in determining the nature and components of potential nontarget impacts, including the magnitude of exposure, exposure pathways, potential receptors, geographic extent, duration/frequency, and likelihood of potential impacts associated with chemical methods application. This discussion focuses on how product use pattern affects these potential impacts.

Three specific chemical methods provide an illustration of how potential hazard or risk may effectively be mitigated by *use pattern*, and how risk assessment findings should be viewed with respect to specific program impacts. Product use pattern is a critical part of the overall impacts assessment as it dictates actual exposure to the material. These methods are used by APHIS ADC on a highly limited and specific basis. APHIS ADC uses should not be confused with the broader and larger scale applications by other users nationwide.

The three examples include:

- The broad-spectrum herbicide **glyphosate** (used by APHIS ADC in ND and SD only, to reduce blackbird habitat; maximum use was 355.6 gallons annually).
- **Brodifacoum**, an anticoagulant rodenticide (used by APHIS ADC only on an isolated atoll near HI; maximum use was 0.002 lb a.i. annually).
- **Fenthion**, a toxicant (used by APHIS ADC in HI and KY to control specific target birds; maximum use was 1 gallon annually).

These products are highly use-pattern specific and are used by APHIS ADC only in a few States in very small quantities. In addition to limitations related to geography and quantity, nontarget exposures are further limited because of restricted modes of application. Use of each of these materials by APHIS ADC constitutes less than 1 percent of the total use nationwide (e.g., 13 million pounds of glyphosate were produced nationwide during 1988).

Risk assessment Hazard Quotient (HQ) values exceeded one (thereby suggesting the presence of an adverse effect) for fenthion (HQ of 100,000 representing potential acute toxicity to the house finch).

Figure 4-2 **Overview of APHIS ADC Direct Control Methods Risk Assesment**

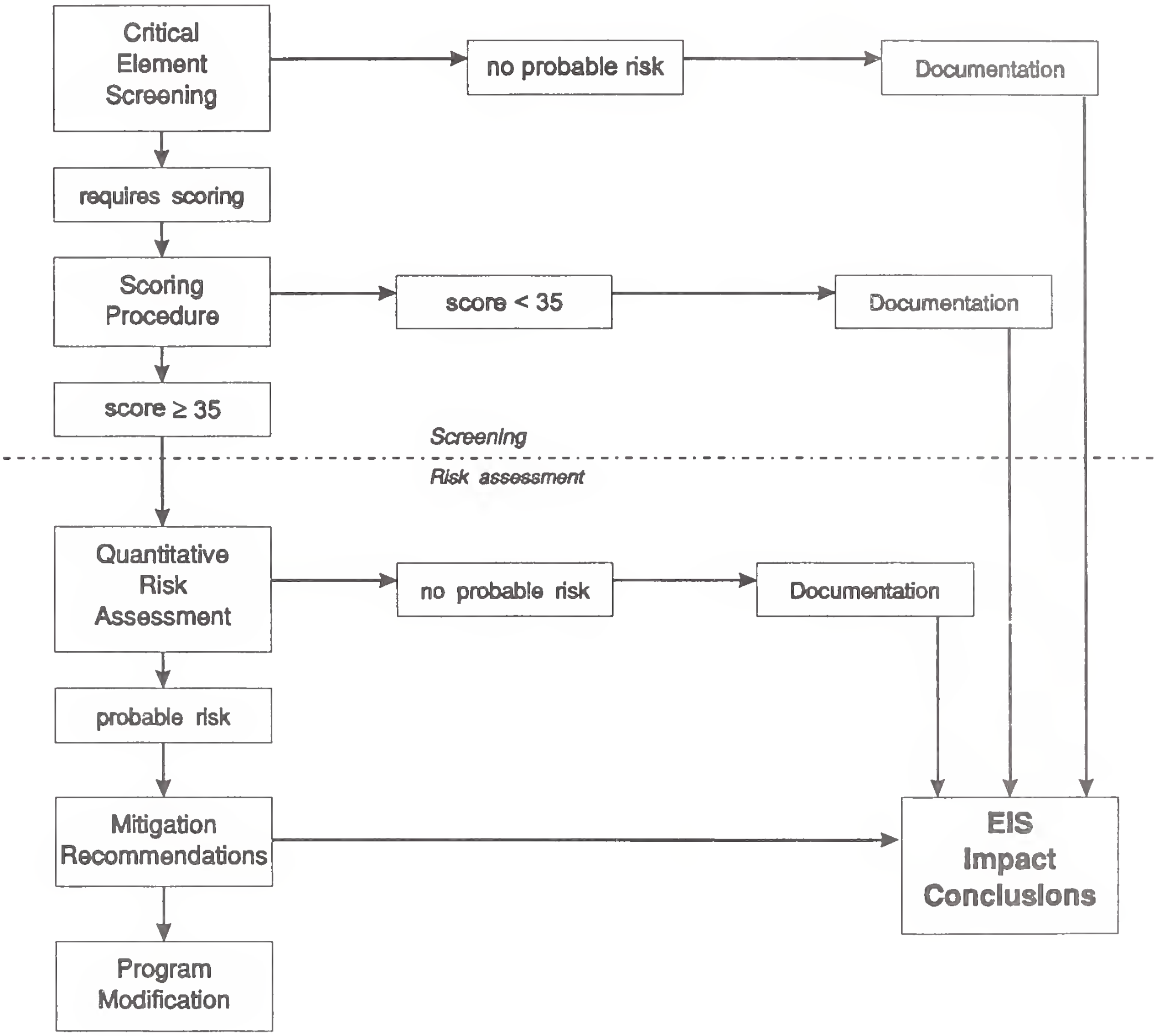


Table 4-7

Scores Resulting From Critical Element Screening of End-Use Formulations

A.I./Product Name	Scores				
		Exposure Component			
	Use Profile Component	Biological Considerations	Chemical Considerations	Toxicity Component	Total Score
Avicides & Other Bird Damage Control Chemicals					
Alpha-chloralose	7	8	5	10	30
4-Aminopyridine (Avitrol), .5%	5	22	10	22	59
4-Aminopyridine (Avitrol), 25%	5	1	10	22	38
DRC-1339, 98%, feedlots	11	25	5	17	58
DRC-1339, 98%, structures	6	21	5	17	49
DRC-1339, 98%, staging areas	8	25	5	17	55
DRC-1339, 98%, eggs/meat bait	4	24	5	17	50
DRC-1339 Gull Toxicant, 98%	4	2	5	17	28
DRC-1339 (Starlicide Complete), 0.1%	4	25	5	17	51
Fenthion (Rid-a-Bird 11%, BCF#1, 9%)	7	23	6	26	62
Glyphosate (Rodeo), 53.8%	8	6	7	6	27
Polybutene	* Not scored. Critical element screening based on lack of toxicity				
Mineral Oil	* Not scored. Critical element screening based on lack of toxicity				
Compound PA-14 (Tergitol), 99.5%	8	11	5	3	27
Strychnine (Pigeon Bait Strychnine Corn), 0.4%	5	27	5	21	58
Strychnine (Sparrow Cracks), 0.6%	5	27	5	21	58
Strychnine Bird Toxicant, 0.35%	4	27	5	21	57
Rodenticides					
Aluminum Phosphide (Fumitoxin, Phostoxin, Detia Rotox), 55% or 57%	9	24	1	15	49
Brodifacoum	* Not scored. Critical element screening based on lack of exposure to nontarget to species				
Cholicalciferol (Quintox), 0.075%	4	1	8	9	22
Sodium Nitrate (gas cartridge for rodents),43.36%	10	25	6	23	64
Strychnine (above ground), 0.35%, 0.5%	9	30	5	21	65
Strychnine (below ground), 0.35%, 0.5%	9	19	5	21	54
Strychnine, 1.6% paste	4	25	5	21	55
Strychnine, 4.9% paste	5	25	5	21	56
Strychnine, 5.79%, salt block	4	23	5	21	53
Zinc Phosphide Concentrate for Mouse Control, 63%	5	22	4	19	50

(Continued)

Table 4-7 (Continued)

Scores Resulting From Critical Element Screening of End-Use Formulations

	Scores				
		Exposure Component			
A.I./Product Name	**Use Profile Component**	**Biological Considerations**	**Chemical Considerations**	**Toxicity Component**	**Total Score**
Zinc Phosphide Concentrate for Muskrat and Nutria Control, 63%	5	7	4	19	35
Zinc Phosphide Concentrate for Rat Control, 63%	9	2	4	19	34
Zinc Phosphide (steam-rolled oats 2%, ZP Rodent Bait AG 2%, ZP Rodent Bait 2%)	11	17	4	19	51
Zinc Phosphide (D&H Formula Rodent Rid-R 2%)	10	14	4	19	47
Zinc Phosphide on Wheat, 1.82%	10	17	4	19	50
Predacides & Other Mammal Damage Control Agents					
Bone Tar Oil	* Not scored. Critical element screening based on lack of toxicity				
Sodium Cyanide (M-44 Cyanide Capsules), 88.62%	10	36	6	21	73
Sodium Fluoroacetate, Compound 1080 (livestock protection collar)	5	22	11	23	61
Sodium Nitrate (gas cartridge for coyotes)	9	21	6	23	59
Immobilizing/euthanizing agents	* Not scored. Critical element screening based on lack of potential exposure to nontargets				

Table 4-8

List of Potentially Affected Threatened and Endangered Species

Pesticide	Potentially Affected T&E Species	Status [a]	Type of Potential Hazard	Specific Label Mitigations	States Where Potential Effects May Occur [b]	References [c]
Avicides						
4-Aminopyridine (Avitrol), 0.5%						
	whooping crane	E	primary	no	TX, NM, ID, KS, OK	FWS 1979, FWS 1992
	Attwater's greater prairie chicken	E	primary	no	TX	FWS 1979
	Aleutian Canada goose	T	primary	no	WA	FWS 1979, FWS 1992
	northern aplomado falcon	E	secondary	no	TX	APHIS ADC 1990
	bald eagle	T&E	secondary	no	ID, KS, KY, NC, NJ, NM, OK, TX, VT, WA, WV	APHIS ADC 1990
	peregrine falcon	E	secondary	no	ID, KS, KY, NC, NJ, NM, OK, TX, VT, WA, WV	APHIS ADC 1990
DRC-1339, 98%, Feedlots; Starlicide Complete, 0.1%						
	Aleutian Canada goose	T	primary	no	WA, OR	FWS 1979
	whooping crane	E	primary	no	ID, NM, UT	FWS 1979, FWS 1992
	bald eagle	T&E	secondary	no	AZ, GA, ID, MS, NJ, NM, NV, OR, UT, VT, WA, WV	APHIS ADC 1990
	peregrine falcon	E	secondary	no	AZ, GA, ID, MS, NJ, NM, NV, OR, UT, VT, WA, WV	APHIS ADC 1990
DRC-1339, 98%, Structures						
	bald eagle	E	secondary	no	GA, IL, IN, KY, MI, TN	APHIS ADC 1990
	peregrine falcon	E	secondary	no	GA, IL, IN, KY, MI, TN	APHIS ADC 1990
DRC-1339, 98%, Staging Areas						
	Attwater's greater prairie chicken	E	primary	no	TX	D&M 1992
	whooping crane	E	primary	no	TX, ND	FWS 1992
	northern aplomado falcon	E	secondary	no	TX	APHIS ADC 1990
	bald eagle	E	secondary	no	TX, ND, LA	APHIS ADC 1990
	peregrine falcon	E	secondary	no	TX, ND, LA	APHIS ADC 1990
DRC-1339, 98%, Eggs/Meat Bait						
	California condor	E	primary	no	CA	D&M 1992
	bald eagle	T&E	primary	no	AZ, CA, ID, NM, NV, OR, UT	D&M 1992
	San Joaquin kit fox	E	primary	no	CA	D&M 1992
	grizzly bear	T	primary	no	ID	D&M 1992
	gray wolf	E	primary	no	ID, NM	D&M 1992
	jaguarundi	E	primary	no	AZ	D&M 1992
	ocelot	E	primary	no	AZ	D&M 1992

(Continued)

Table 4-8 (Continued)

List of Potentially Affected Threatened and Endangered Species

Pesticide	Potentially Affected T&E Species	Status[a]	Type of Potential Hazard	Specific Label Mitigations	States Where Potential Effects May Occur[b]	References[c]
Fenthion (BCF#1), 9%, and (Rid-A-Bird), 11%						
	bald eagle	E	secondary	no	KY	APHIS ADC 1990
	peregrine falcon	E	secondary	no	KY	APHIS ADC 1990
Strychnine (Pigeon Bait Strychnine Corn, Sparrow Cracks, and bird toxicant)						
	Attwater's greater prairie chicken	E	primary	no	TX	FWS 1979
	whooping crane	E	primary	no	TX	APHIS ADC 1990
	northern aplomado falcon	E	secondary	no	TX	APHIS ADC 1990
	bald eagle	E	secondary	no	LA, TX	FWS 1992
	peregrine falcon	E	secondary	yes	LA, TX	FWS 1979, FWS 1988, APHIS ADC 1990, FWS 1992
	jaguarundi	E	secondary	no	TX	APHIS ADC 1990
	ocelot	E	secondary	no	TX	APHIS ADC 1990
	Louisiana black bear	T	secondary	no	LA, TX	D&M 1992
Rodenticides						
Aluminum Phosphide (Fumitoxin, Phostoxin, Detia-Rotox), 55% or 57%						
	New Mexican ridge-nosed rattlesnake	T	primary	no	NM	FWS 1989
	Mexican gray wolf	E	primary	no	NM	D&M 1992
Sodium Nitrate (gas cartridge for rodents), 43.36%						
	Fresno kangaroo rat	E	primary	no	CA	FWS 1992
	giant kangaroo rat	E	primary	no	CA	FWS 1992
	Morro Bay kangaroo rat	E	primary	no	CA	FWS 1992
	Stephens' kangaroo rat	E	primary	no	CA	D&M 1992
	Tipton kangaroo rat	E	primary	no	CA	FWS 1992
	salt marsh harvest mouse	E	primary	no	CA	FWS 1992
	Point Arena mountain beaver	E	primary	no	CA	D&M 1992
	black-footed ferret	E	primary	yes	ND, NE, NM, OK	FWS 1979, APHIS ADC 1990, FWS
	San Joaquin kit fox	E	primary	yes	CA	FWS 1979, FWS 1992
	gray wolf	T	primary	no	ID, MN, NM	D&M 1992
	New Mexican ridge-nosed rattlesnake	T	primary	no	NM	FWS 1989
	San Francisco garter snake	E	primary	no	CA	FWS 1992

(Continued)

Table 4-8 (Continued)

List of Potentially Affected Threatened and Endangered Species

Pesticide	Potentially Affected T&E Species	Status [a]	Type of Potential Hazard	Specific Label Mitigations	States Where Potential Effects May Occur [b]	References [c]
	blunt-nosed leopard lizard	E	primary	yes	CA	FWS 1992
	island night lizard	T	primary	no	CA	EPA 1991
	gopher tortoise	T	primary	yes	LA	APHIS ADC 1990, FWS 1992
	desert tortoise	T	primary	yes (in Utah)	CA	FWS 1992
	Santa Cruz long-toed salamander	E	primary	no	CA	EPA 1991
Strychnine (Strychnine milo 0.35%, steam-rolled oats 0.5%), above-ground use						
	Aleutian Canada goose	T	primary	yes	OR	FWS 1979, FWS 1988, APHIS ADC 1990, FWS 1992
	whooping crane	E	primary	no	NE, NM	FWS 1979, FWS 1988, APHIS ADC 1990, FWS 1992
	gray wolf	E	secondary	yes	NM	FWS 1979, FWS 1988, APHIS ADC 1990, FWS 1992
	bald eagle	E	secondary	no	NE, NM, OR	FWS 1988, APHIS ADC 1990, FWS
	peregrine falcon	E	secondary	no	NE, NM, OR	D&M 1992
Strychnine (Strychnine milo, 0.35%, steam-rolled oats 0.5%), below-ground use						
	ocelot	E	secondary	no	TX	APHIS ADC 1990
	jaguarundi	E	secondary	no	TX	APHIS ADC 1990
	gray wolf	E	secondary	yes	NM	APHIS ADC 1990
	northern aplomado falcon	E	secondary	no	TX	APHIS ADC 1990
	bald eagle	T&E	secondary	no	NE, NM, OR, TX	APHIS ADC 1990
	peregrine falcon	E	secondary	no	NE, NM, OR, TX	D&M 1992
Strychnine, 1.6% paste, 4.9% paste						
	whooping crane	E	primary	no	ID	APHIS ADC 1990
	woodland caribou	E	primary	no	ID	D&M 1992
	bald eagle	T&E	secondary	no	ID, WA	FWS 1982, APHIS ADC 1990
	gray wolf	E	secondary	yes	ID, WA	FWS 1982, APHIS ADC 1990
	grizzly bear	T	secondary	yes	ID, WA	FWS 1982
	peregrine falcon	E	secondary	no	ID, WA	FWS 1982

(Continued)

Table 4-8 (Continued)

List of Potentially Affected Threatened and Endangered Species

Pesticide	Potentially Affected T&E Species	Status[a]	Type of Potential Hazard	Specific Label Mitigations	States Where Potential Effects May Occur[b]	References[c]
Strychnine, 5.79%, salt block						
	bald eagle	T	secondary	no	OR	D&M 1992
	peregrine falcon	E	secondary	no	OR	D&M 1992
	northern spotted owl	T	secondary	no	OR	D&M 1992
Zinc Phosphide Concentrate for Mouse Control, 63%						
	whooping crane	E	primary	no	ID	APHIS ADC 1990
	woodland caribou	E	primary	no	ID	D&M 1992
Zinc Phosphide (ZP Rodent Bait AG 2%, D&H Formula Rodent Rid-R 2%, ZP Rodent Bait 2%, 1.82% wheat)						
	whooping crane	E	primary	yes	ND, NE, NM, OK	FWS 1979, FWS 1981, APHIS ADC 1990, FWS 1992
	Aleutian Canada goose	T	primary	yes (in CA only)	OR	FWS 1979, FWS 1981, APHIS ADC 1990, FWS 1992
Predacides						
Sodium Cyanide (M-44 Cyanide Capsules), 88.62%)						
	California condor	E	primary	no	CA	APHIS ADC 1990, FWS 1992
	San Joaquin kit fox	E	primary	no	CA	FWS 1979, APHIS ADC 1990, FWS
	jaquarundi	E	primary	no	TX, AZ	APHIS ADC 1989, APHIS ADC 1990
	ocelot	E	primary	no	TX, AZ	APHIS ADC 1989, APHIS ADC 1990
	gray wolf	E	primary	no	WA, ID, MT, WY, NM	FWS 1979, APHIS ADC 1990, FWS
	grizzly bear	T	primary	no	WA, ID, MT, WY, NM	FWS 1979, APHIS ADC 1990, FWS
Sodium Fluoroacetate, Compound 1080 (livestock protection collar) 1.04%						
	ocelot	E	primary	no	TX	D&M 1992
	jaguarundi	E	primary	no	TX	D&M 1992
	bald eagle	E	primary	no	TX	FWS 1985, APHIS ADC 1990
Sodium Nitrate (gas cartridge for coyotes), 65%						
	San Joaquin kit fox	E	primary	yes	CA	FWS 1979, FWS 1992
	Utah prairie dog	T	primary	no	UT	FWS 1979

(Continued)

Table 4-8 (Continued)

List of Potentially Affected Threatened and Endangered Species

Pesticide	Potentially Affected T&E Species	Status[a]	Type of Potential Hazard	Specific Label Mitigations	States Where Potential Effects May Occur [b]	References [c]
	gray wolf	E	primary	yes	NM, WY, WA, NV, MT	FWS 1979
	black-footed ferret	E	primary	no	WY, UT, MT, CO, ND	D&M 1992
	New Mexican ridge-nosed rattlesnake	T	primary	no	NM	FWS 1989
	blunt-nosed leopard lizard	E	primary	no	CA	FWS 1992
	desert tortoise	T	primary	no	CA, NV, UT	D&M 1992
	San Francisco garter snake	E	primary	no	CA	D&M 1992
	Wyoming toad	E	primary	no	WY	D&M 1992

[a] Status:
T = Threatened
E = Endangered
T&E = Threatened in some areas; endangered in other areas (bald eagle).

[b] Species occur in these States where APHIS ADC used the product during FY 1988 through FY1991.

[c] References:

APHIS ADC 1989: U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Animal Damage Control. 1989. Letter from State Director of APHIS ADC to Field Supervisor of FWS. Re: Request for consultation on potential effects of Texas APHIS ADC program activites on ocelot and jaguarundi. Dated December 12, 1989.

APHIS ADC 1990: U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Animal Damage Control. 1990. Animal Damage Control Program. Draft Environmental Impact Statement. APHIS DEIS 90-001.

D&M 1992: Dames & Moore. 1992. Threatened and Endangered Species Database on Excel. Compilation from Federal Register, field guides, and other sources on geographic distribution, habitat use, and diet of T&E birds, mammals, reptiles, and amphibians.

EPA 1991e: U.S. Environmental Protection Agency. 1991. Letter from EPA to FWS. Re: Request for formal Section 7 consultation on 31 pesticides. Dated February 26, 1991.

USFWS 1979: Department of the Interior, U.S. Fish and Wildlife Service. 1979. Letter from the Director of FWS to Chief of APHIS ADC. Re: Biological Opinion - Section 7 Consultation for the Animal Damage Control Program. Dated January 2, 1981.

USFWS 1982: Department of the Interior, U.S. Fish and Wildlife Service. 1982. Memorandum from Associate Director of Wildlife Resources to Associate Director of Federal Assistance. Re: Amendment to ADC Section 7 Consultation.

USFWS 1988: Department of the Interior, U.S. Fish and Wildlife Service. 1988. Memorandum from Deputy Regional Director (Region 6). Re: Reinitiation of Section 7 formal consultation on above ground uses of strychnine. Dated May 25, 1988.

USFWS 1989: Department of the Interior, U.S. Fish and Wildlife Service. 1989. Biological Opinion on Selected Pesticides - Dated June 14, 1989. Revised September 14, 1989. PB90-122664.

USFWS 1992: Department of the Interior, U.S. Fish and Wildlife Service. 1992. Draft Biological Opinion. Animal Damage Control Program. Dated July 28, 1992 (See Appendix F).

This elevated HQ value suggests that nontarget hazards could occur in association with exposure to the product.

Figure 4-3 graphically depicts the relationship and contribution of risk assessment to the overall impacts evaluation process. It shows that while risks to individual organisms may not constitute a significant change in biological populations, habitats, or communities, they may still require mitigation. The need for mitigation measures may be recognized as a result of either the risk assessment or the overall impacts evaluation.

Table 4-12 summarizes the formulation-specific risk assessment, for all specific indicator species used to support conclusions, including specific toxicological benchmarks and exposure pathways considered. "Probable risk" products for which HQ values were found to exceed one, however, do not necessarily signify that an impact of biological significance would follow. This is because the risk assessment focused on potential acute or chronic toxicological effects to individual receptors, but individual receptors or groups of receptors may not always be reflective of effects upon the larger population. Therefore, further analysis was needed to determine whether the potential effects noted in Table 4-12 constitute program impacts.

The quantitative risk assessment paradigm adopted for the APHIS ADC Program was designed to address potential effects to individual organisms rather than to populations or ecological communities. Although uncertainty is inherent in the process, the approach is designed to be conservative in estimating potential risks. An HQ value which exceeds one indicates that a potential risk may exist. However, it does not mean that impacts to populations or specific organisms will occur. Even if an HQ value exceeds one, additional analyses of potential hazards to T&E species may result in a finding of no adverse impacts. Such a finding may result because the risk assessment emphasizes toxicological rather than ecological factors. The calculation of HQ values may not be sensitive to mitigation measures for T&E species which are specified on product labels.

Accordingly, a stepwise approach was adopted to determine whether an elevated risk assessment HQ value for an individual formulated product would translate into an impact of significance.

- Products screened out or with HQ values of less than one were determined to be of no significant impact.
- Products for which HQ values exceeded one based on indicator species but **without** T&E species considerations are addressed as a unit.
- Products for which HQ values exceeded one based on indicator species **with** T&E species considerations are addressed.

These latter products were then subjected to a separate analysis relating to the T&E species of concern, listed on Table 4-13. This analysis was conducted together with specified label restrictions which could serve to reduce the likelihood of exposure, geographic extent, exposure duration, and magnitude of impact, following the designations set forth in Table 4-1 in assigning impact levels.

Part of this analysis included species not included under the Endangered Species Act. These animals (e.g., mountain lion, other large birds or predators) are viewed as particularly vulnerable to impacts by chemical methods because they are relatively low in abundance and may be more vulnerable to localized population impacts.

The risk assessment conclusions by individual formulation, detailed in Appendix P, were derived on the basis of exposure of both nonlisted and listed T&E species. The criteria used to formulate conclusions concerning whether effects to a nonlisted species are likely include:

- Acute and chronic Hazard Quotient (HQ) values
- Bioaccumulation potential
- Reports of take (as nontarget species)

Table 4-9

Environmental Fate Characteristics by Active Ingredient

Compound	Partitioning: Mobility (Soil, Water)	Partitioning: Bioaccumulation	Persistence (Soil, Water)
Avicides			
Alpha-chloralose	Generally moderate (high solubility).	Low.	Low.
4-Aminopyridine	Low; generally strongly adsorbed on soil colloids, although sorption is pH-dependent.	No evidence in literature; rapidly metabolized by birds and others.	High; $t_{1/2}$ = 3-22 months
DRC-1339	Moderately high especially in coarse-textured soils due to high water solubility and low Koc.	Not likely; rapidly metabolized by birds.	Low; $t_{1/2}$ = <2 days
Fenthion	Moderately low due to low water solubility and moderate Koc; Kd = 7.7-67.	Low to moderate based on Kow.	Low; $t_{1/2}$ = <1 day in nonsterilized silty loam.
Glyphosate (Rodeo)	Low due to high Koc; although solubility is high.	Not likely, but does translocate readily into foliage.	Moderate; $t_{1/2}$ = 30 days.
Compound PA-14 (Tergitol)	Moderately mobile; highly soluble, but adheres to organic surfaces, not soils; not pH-sensitive.	Not likely; efficiently degraded in all environments.	Low; $t_{1/2}$ = 4 days in water.
Strychnine	Moderately low due to moderate solubility and moderate Koc. As a pure alkaloid, may be adsorbed on clays or organic matter. Mobile in acid soils due to acid salty formation. Vertical soil movement determined to be minimal in experimental studies.	Low.	Moderately low; $t_{1/2}$ = 7-28 days in water.
Rodenticides			
Aluminum Phosphide	Insoluble and immobile; converts to phosphine gas and ultimately to orthophosphate.	Does not accumulate in animal tissue.	Low; $t_{1/2}$ (as gas) = several days.
Cholecalciferol	Insoluble and probably immobile.	No data available.	No data available.
Sodium Nitrate	High; readily soluble. Combustion or degradation of unused gas cartridges likely to result in oxides of carbon, nitrogen, phosphorus, and sulfur. All of these products likely to be used by soil microorganisms or enter their respective elemental cycles.	Extremely unlikely.	Low; gas escapes to atmospher. NO_3-N entering groundwater is likely to undergo degradation.
Zinc Phosphide	Insoluble and generally immobile. Under moist conditions in soil, zinc phosphide breaks down to PH_3, which is released into the atmosphere or converted to phosphates and zinc complexes.	Does not accumulate in animal tissue.	Moderate to low; decomposes within 30 days. Phosphine gas is converted to harmless phosphates.

(Continued)

Table 4-9 (Continued)

Environmental Fate Characteristics by Active Ingredient

Compound	Partitioning: Mobility (Soil, Water)	Partitioning: Bioaccumulation	Persistence (Soil, Water)
Predicides & Other Agents			
Sodium Cyanide (M-44s)	High, sodium cyanide is rapidly hydrolyzed to HCN gas by available soil moisture. Infiltrates through soil as sodium cyanide to groundwater where it is readily degraded by microorganisms or other mechanisms.	Extremely unlikely; metabolized immediately.	HCN readily degraded by microorganisms; half-life in surface water is 5 to 50 hr.
Sodium Fluoroacetate	Appears high based on high solubility; but LP Collar limits release and leaching from upper soil layers hampered by potentially high adsorption to root or other plant tissues.	Unlikely due to high solubility, although data are absent.	Moderately high; slow degradation in soil by microorganisms, with toxicity substantialy reduced within 2 weeks.
Sodium Nitrate	High; readily soluble. Nitrate-nitrogen may be leached from soils to groundwater; nitrate eventually reaches nitrogen cycle. Under poor drainage and aeration, nitrate may be reduced to result in escape of NOx gases.	Extremely unlikely.	Low; gas escapes to atmosphere. NO3-N entering groundwater is likely to undergo degradation.

Table 4-10

Summary of Toxicological Properties by Active Ingredient

	Avian		Mammalian		Aquatic	
Active Ingredient	Acute	Chronic	Acute	Chronic	Acute	Chronic
Alpha-chloralose	highly toxic; 9 to >775 mg/kg LD_{50}	NA	moderately toxic; 175 to >600 mg/kg LD_{50}	NA	NA	NA
4-Aminopyridine	very highly toxic; 1.78 - 35 mg/kg LD_{50}	1.8 - 53 mg/kg-d (NOEL - LC_{50})	very highly toxic; 0.6 - 12 mg/kg	3 - 5 mg/kg-d (NOEL - edema)	moderately toxic; 1.4 - 400 mg/L LC_{50}	NA
DRC-1339	very highly toxic; 1.8 - >320 mg/kg LD_{50}	0.3 - 21 mg/kg-d LD_{50}	slightly toxic; >100 - 1,800 mg/kg	NA	moderately toxic; 1.6 - 38 mg/L	NA
Fenthion	very highly toxic; 1.7 - 22.7 mg/kg LD_{50} 1.8 - 44 mg/kg dermal LD_{50}	0.5 mg/kg-d Min LD	moderately toxic; 88 - 260 mg/kg LD_{50} 320 - 1,680 mg/kg dermal LD_{50}	1.0 - 10 mg/kg-d fetotox/NOEL	very highly toxic; 0.0008 - 3.2 mg/kg EC_{50}/LC_{50}	NA
Mineral Oil	0.6 ml/egg lethally	0.02 mg/egg NOEL	practically non-lethal 5,000 to 15,000 mg/kg	NA	NA	NA
Glyphosate	practically non-acute >3,850 mg/kg LD_{50}	NA	slighty toxic; 1,500 to 5,700 LD_{50}	15 to 750 mg/kg NOEL	moderately toxic; 2.3 to 930 mg/L LC_{50}	NA
PA-14	slightly toxic; 900 mg/kg LD_{50} acute dermal = 19,900 mg/kg	NA	slightly toxic; 650 - 1,250 mg/kg LD_{50} slightly toxic; 2,000 mg/kg dermal LC_{50}	350 to 830 mg/kg-d NOEL/LOEL	moderately toxic; 3.0-6.2 mg/L ML_{50}	NA
Polybutene	NA	NA	practically non-acute >15,000 mg/kg LD_{50}	NA		
Strychnine	very highly toxic; 3.1 - 161 mg/kg LD_{50}	9 - 90 mg/kg-d NOEL	very highly toxic; 0.6 - 24 mg/kg LD_{50}	>1.44 - 2.5 NOEL/LOEL	moderately toxic; 0.3 - 1.0 mg/L NOEL/LC_{50}	NA
Aluminum Phosphide	NA	NA	highly toxic; 1 - 40 ppm inhalation LD	0.03 mg/kg-d NOEL	NA	NA

Table 4-10 (Continued)

Summary of Toxicological Properties by Active Ingredient

	Avian		Mammalian		Aquatic	
Active Ingredient	**Acute**	**Chronic**	**Acute**	**Chronic**	**Acute**	**Chronic**
Brodifacoum	very highly toxic; 0.33 to 10 mg/kg LD_{50}	4.8 mg/kg-d lethality	very highly toxic; 0.15 to 3.5 mg/kg LD_{50}	0.021 mg/kg-d LD_{50}	very highly toxic; 0.04 to 0.89 mg/L LC_{50}	NA
Cholecalciferol	moderately toxic; 48 to 600 mg/kg LD_{50}	NA	highly toxic: 42 to 264 mg/kg LD_{50}	NA	NA	NA
Sodium Nitrate	very highly toxic; 4 to 21 mg/kg LD_{50}	NA	very highly toxic; 1.2 - 3,700 mg/kg lethality	220 - 340 mg/kg-d NOEL/LOEL	very highly toxic; >0.05 mg/L LC_{50}	>0.0079 mg/l
Zinc Phosphide	very highly toxic; 7 to 237 mg/kg LD_{50}	0.27 mg/kg reproductive effect	very highly toxic; 5.6 to 70 mg/kg lethality	1 to 3.7 mg/kg-d NOEL	very highly toxic; 0.05 to 1.4 mg/L LC_{50}	0.058 mg/L final chronic value
Bone Tar Oil	NA	NA	NA	NA	NA	NA
Sodium Cyanide	very highly toxic; 4 to 21 mg/kg LD_{50}	NA	very highly toxic; 1.2 to 15 mg/kg LD_{50}	20 mg/kg-d NOEL	very highly toxic; 0.01 to 0.75 mg/L LC_{50}	7.9 to 16 ug/L LOEL
Sodium Fluoroacetate	very highly toxic; 0.6 to 20 mg/kg LD_{50}	0.5 mg/kg-s EMLD	very highly toxic; 0.065 to 10 mg/kg LD_{50}	0.055 mg/kg-d LOEL	NA	NA
Immobilizing/ Euthanizing Agents	very highly toxic	NA	very highly toxic	NA	NA	NA

NA = Not Applicable

Additional criteria used to formulate conclusions concerning whether effects to T&E species are likely include:

- Literature reports
- Occurrence of T&E species within range of application
- Presence of suitable habitat within range of application

While the two analyses were conducted separately, primarily because of the need for evaluating T&E species in the context of population impacts (in compliance with ESA), selected nonlisted indicators were implicitly assumed to represent potential T&E receptors as well. The results of the two discrete analyses were integrated to formulate product-specific conclusions for each individual product (discussed in greater detail in Appendix P).

Appendix P summarized the risk assessment conclusions by formulation, including a comparison with findings from USFWS Biological Opinions (USDI 1979, 1982, 1989a, 1992a; and an USEPA Request for Section 7 Consultation (EPA 1991b). As noted in Appendix P, findings of the risk assessment are generally in agreement with those presented in these other documents. In cases where findings are not in total agreement, precedence will be given to conclusions and recommendations in the Biological Opinions provided by the USFWS (Appendix F).

As noted above, Figure 4-3 schematically depicts the relationship between risk and APHIS ADC program impacts. While risk is estimated for protection of individual organisms and incorporates both exposure and toxicity, a key element in determining potential biological impacts is that an effect on an individual nontarget organism does not necessarily constitute a nationwide (programmatic) impact (i.e., an impact upon abundance or diversity of nontarget wildlife). Figure 4-3 also depicts that estimations of risk may be used to avoid potential biological impacts.

(a) Evaluation of Impacts by Individual Product

The following discussion summarizes the results of the product-specific impacts evaluation for APHIS ADC chemical methods.

"No-probable risk" Products

Thirteen chemical methods were designated as "no-probable risk" products based on the risk assessment. These included alpha-chloralose, DRC-1339 (gull toxicant, egg and meat baits), mineral oil, glyphosate, Compound PA-14, polybutene, brodifacoum, cholecalciferol, zinc phosphide (concentrate for rat control), bone tar oil, sodium nitrate (gas cartridge for coyotes), and immobilizing/euthanizing agents.

Based on the findings of this conservative risk assessment approach, all of these products are most appropriately designated as having no significant impact on species abundance or diversity.

Products for which HQ values exceeded one (1) without T&E species concerns

The products for which HQ values exceeded one (i.e., designated as "may pose potential risk") based on the risk assessment but *without* T&E species concerns, include:

- 4-aminopyridine (25% concentrate for gulls)
- DRC-1339
  - 98%, feedlots
  - Starlicide Complete
  - 98%, structures
- Fenthion (9 and 11%)
- Zinc phosphide (muskrat and nutria control)

Figure 4-3 **Impact Evaluation Process for Chemical Control Methods**

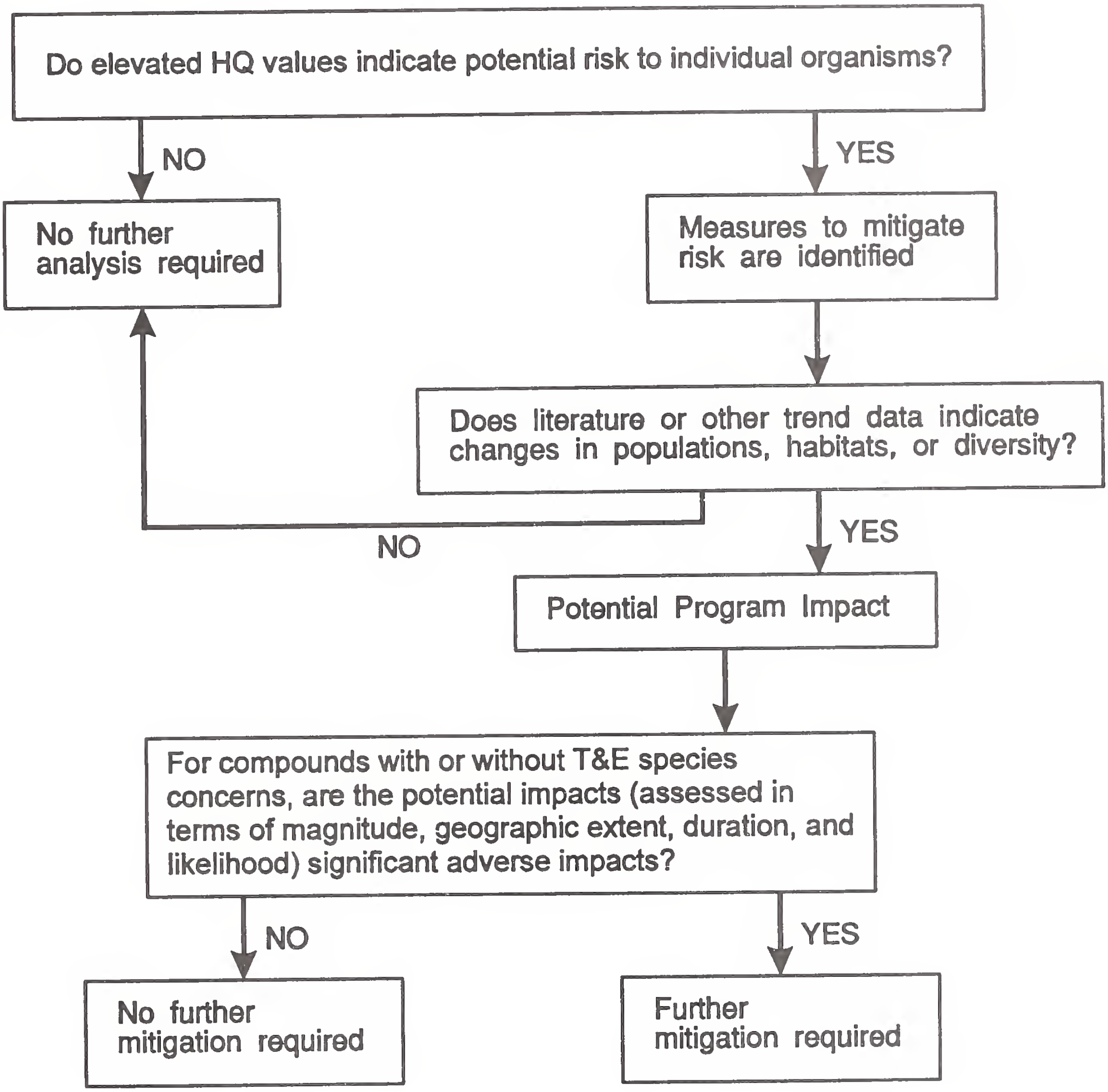


Table 4-11

Key Exposure Parameters used for Quantitative Risk Assessment by End-Use Formulation[a]

Active Ingredient	Indicator Species (wildlife)	Exposure Pathway	Total Ingestion Rate [b] (g/day)	Body Weight (g/animal)
4-Aminopyridine (Avritol, 0.5%)	eastern meadowlark *(Stumella magna)*	ingestion of bait	10.5	105
	American kestrel *(Falco sparverius)*	ingestion of prey	5.55	111
	freshwater fish	water	NA	NA
(Avitrol 25% Concentrate)	American crow	ingestion of bait	32	400
DRC-1339 (98%)	(representative scenario is staging area)			
(staging area)	northern cardinal *(Cardinalis cardinalis)*	ingestion of bait	6.47	43
(staging area)	American kestrel *(Falco sparverius)*	ingestion of prey	5.55	111
(egg and meat baits)	golden eagle *(Aquila chrysaetos)*	ingestion of bait	234	4,672
(egg and meat baits)	coyote *(Canis latrans)*	ingestion of bait	650	10,000
(structures)	House finch *(Carpodacus mexicanis)*	ingestion of bait	4.36	22
(feedlots and Starlicide)	eastern meadowlark *(Stumella magna)*	ingestion of bait	10.5	105
(staging area)	freshwater fish	water	NA	NA
Fenthion	house finch *(Carpocadus mexicanis)*	dermal absorption	4.36	22
	American kestrel *(Falco sparverius)*	ingestion of prey	5.55	111
Strychnine	(representative scenario is SRO 0.5% above ground)			
Pigeon Bait/Bird Toxicant/ Sparrow Cracks	eastern meadowlark *(Stumella magna)*	ingestion of bait	10.5	105
Pigeon Bait/Bird Toxicant/ Sparrow Cracks	American kestrel *(Falco sparverius)*	ingestion of prey	5.55	111
SRO 0.5% (above ground)	horned lark *(Eremophilla alpestris)*	ingestion of bait	5.55	37
SRO 0.5% (all uses)	American kestrel *(Falco sparverius)*	ingestion of prey	5.55	111
SRO 0.5% (all uses)	deer mouse *(Peromyscus manicutalis)*	ingestion of bait	4.59	27
SRO 0.5% (all uses)	coyote *(Canis latrans)*	ingestion of prey	650	10,000
0.35% milo	horned lark *(Eremophilla alpestris)*	ingestion of bait	5.55	37
0.35% milo	deer mouse *(Peromyscus manicutalis)*	ingestion of bait	4.59	27
1.6% paste	deer mouse *(Peromyscus manicutalis)*	ingestion of bait	4.59	27

(Continued)

Diet Fraction							Calculated Pesticide Concentration[e]				
Grain	Birds	Mammals	Carrion	Home Range (acres)	Estimated % of Range[c]	Repellency Factor[d]	Soil[f] maximum/ minimum (mg/kg)	Water maximum/ minimum (mg/L)	Grain (mg/kg)	% Degradation	Tissue (mg/kg)
50%	NA	NA	NA	3	100%	1%[d]	0.0031/ 0.0001	0.00029/ 0.00018	1,000	98%	4.90
NA	16%	NA	NA	275	7%	NA	0.0031/ 0.0001	0.00029/ 0.00018	1,000	98%	4.90
NA	NA	NA	NA	NA	100%	NA	NA	0.0003	NA	NA	NA
50%	NA	NA	NA	20	50%	NA	0.0031	NA	167[g]	98%	NA
50%	NA	NA	NA	3	100%	NA	1.3/ 0.09	0.029/ 0.023	5,000	4%	NA
NA	16%	NA	NA	275	7%	NA	1.3/ 0.09	0.029/ 0.023	NA	NA	17.7
NA	NA	NA	5%	3,520	3%	NA	1.3/ 0.09	0.029/ 0.023	NA	NA	5,000
NA	NA	NA	10%	10,800	1%	NA	1.3/ 0.09	0.029/ 0.023	NA	NA	5,000
50%	NA	NA	NA	0.8	100%	NA	1.3/ 0.09	0.029/ 0.023	3,700	4%	NA
50%	NA	NA	NA	3	100%	NA	1.3/ 0.09	0.029/ 0.023	1,000	4%	NA
NA	NA	NA	NA	NA	100%	NA	NA	0.029	NA	NA	NA
NA	NA	NA	NA	0.80	100%	NA	NA	NA	1.E+5[h]	NA	NA
NA	16%	NA	NA	275	7%	NA	NA	NA	NA	NA	9.5
50%	NA	NA	NA	3	100%	NA	0.23/ 0.06	0.0046/ 4.3E-05	6,000	80%	NA
NA	16%	50%	NA	275	7%	NA	0.23/ 0.06	0.0046/ 4.3E-05	NA	NA	21
50%	NA	NA	NA	13	100%	NA	0.23/ 0.06	0.0046/ 4.3E-05	5,000	80%	NA
NA	16%	50%	NA	275	7%	NA	0.23/ 0.06	0.0046/ 4.3E-05	NA	NA	14
50%	NA	NA	NA	0.5	100%	NA	0.23/ 0.06	0.0046/ 4.3E-05	5,000	80%	NA
NA	NA	54%	NA	10,800	1%	NA	0.23/ 0.06	0.0046/ 4.3E-05	5,000	80%	21
50%	NA	NA	NA	13	100%	NA	0.23/ 0.06	0.0046/ 4.3E-05	3,500	80%	NA
50%	NA	NA	NA	0.5	100%	NA	0.23/ 0.06	0.0046/ 4.3E-05	3,500	80%	NA
50%	NA	NA	NA	0.5	100%	NA	0.23/ 0.06	0.0046/ 4.3E-05	8,300	80%	NA

(Continued)

Table 4-11 (Continued)

Key Exposure Parameters used for Quantitative Risk Assessment by End-Use Formulation[a]

Active Ingredient	Indicator Species (wildlife)	Exposure Pathway	Total Ingestion Rate [b] (g/day)	Body Weight (g/animal)
4.9% paste	deer mouse *(Peromyscus manicutalis)*	ingestion of bait	4.59	27
Salt block	(i)			
(SRO above ground)	freshwater fish	water	NA	NA
Zinc Phosphide	(representative scenario is 2% AG and muskrat for aquatic receptors)			
2% AG (all 1.8-2% baits)	ring-necked pheasant *(Phasianus colchicus)*	Ingestion of bait	56.65	1,133
2% AG (all 1.8-2% baits)	deer mouse *(Peromyscus maniculatis)*	ingestion of bait	4.59	27
For mouse control	deer mouse *(Peromyscus maniculatis)*	ingestion of bait	4.59	27
For muskrat and nutria control	freshwater fish	water	NA	NA
	freshwater fish	zinc in water	NA	NA
Sodium Fluoroacetate (Compound 1080)	golden eagle *(Aquila chrysaetos)*	ingestion of bait	234	4,672
	black vulture *(Coragyps atratus)*	ingestion of bait	140	2,000
	red fox *(Vulpea fulva)*	ingestion of bait	177	5,900
	red fox *(Vulpea fulva)*	ingestion of prey	177	5,900

[a] Information taken from Tables P-17, P-19, and Figures P-4 to P-12.

[b] Information derived from Kenaga (1973), using fraction of body weight consumed.

[c] Assumed application areas of 20 to 100 acres divided by home range listed in Table P-17.

[d] Besser *et al.*, (1984) and De Grazio et al. (1972), estimate that distress cries clears targets from treated fields with less than 1% of the population directly affected.

[e] Calculated environmental concentrations based on soil and water modeling (Figures P-4 to P-12), bait concentration and degradation, and LD_{50} prey concentration.

[f] Soil ingestion assumed to be 5% of daily ingestion rate for all terrestrial animals.

[g] Pesticide intake equal to one cube ingested covered with 167 mg of a.i.

[h] Assumes that the exposure point concentration for feet (via dermal absorption) is the same as the formulated product (11%). Assumes the area of dermal exposure on birds feet is 5 cm^2.

[i] Indicator species of the representation scenario; horned lark, American kestrel, deer mouse, and coyote.

NA = Not applicable.

Diet Fraction							Calculated Pesticide Concentration[e]				
Grain	Birds	Mammals	Carrion	Home Range (acres)	Estimated % of Range[c]	Repellency Factor[d]	Soil[f] maximum/ minimum (mg/kg)	Water maximum/ minimum (mg/L)	Grain (mg/kg)	% Degradation	Tissue (mg/kg)
50%	NA	NA	NA	0.5	100%	NA	0.23/ 0.06	0.0046/ 4.3E-05	2,700	80%	NA
NA	NA	NA	NA	NA	100%	NA	NA	0.0046	NA	NA	NA
50%	NA	NA	NA	4	100%	NA	1.375	0.0041 0.0004	2,000	57%	NA
50%	NA	NA	NA	0.5	100%	NA	1.375	0.0041 0.0004	2,000	57%	NA
50%	NA	NA	NA	0.5	100%	NA	1.375	0.0041 0.0004	6,600	57%	NA
NA	NA	NA	NA	NA	100%	NA	NA	0.0041	NA	100%	NA
NA	NA	NA	NA	NA	100%	NA	NA	0.0004	NA	100%	NA
NA	NA	NA	5%	3,520	3%	NA	NA	NA	NA	NA	NA
NA	NA	NA	100%	36,771	0.27%	NA	NA	NA	NA	NA	NA
NA	NA	NA	10%	1,280	8%	NA	NA	NA	NA	NA	NA
NA	NA	NA	10%	1,280	8%	NA	NA	NA	NA	NA	5.00

Table 4-12

Conclusions for Threatened and Endangered Species From the Risk Assessment and USFWS Biological Opinions, by Formulation

Pesticide	Potentially Affected Species	Status [a]	Hazard Type [b]	Risk Assessment	U.S. Fish & Wildlife Service Biological Opinions
Avicides					
4-Aminopyridine (Avitrol), 0.5%					
	whooping crane	E	1	probable risk	may affect, no jeopardy (FWS 1992)
	Attwater's greater prairie chicken	E	1	probable risk	may affect, no jeopardy (FWS 1979)
	Aleutian Canada goose	T	1	probable risk	may affect, no jeopardy (FWS 1979)
	northern aplomado falcon	E	2	no probable risk (HQ values)	
	bald eagle	T&E	2	no probable risk (HQ values)	
	peregrine falcon	E	2	no probable risk (HQ values)	
DRC-1339, 98%, feedlots; Starlicide Complete, 0.1%					
	Aleutian Canada goose	T	1	no probable risk (habitat)	may affect, no jeopardy (FWS 1979)
	whooping crane	E	1	no probable risk (habitat)	may affect, no jeopardy (FWS 1992)
	bald eagle	T&E	2	no probable risk (HQ values)	
	peregrine falcon	E	2	no probable risk (HQ values)	
DRC-1339, 98%, structures					
	bald eagle	T&E	2	no probable risk (HQ values)	
	peregrine falcon	E	2	no probable risk (HQ values)	
DRC-1339, 98%, staging areas					
	Attwater's greater prairie chicken	E	1	probable risk	
	whooping crane	E	1	probable risk	
	northern aplomado falcon	E	2	no probable risk (HQ values)	
	bald eagle	T&E	2	no probable risk (HQ values)	
	peregrine falcon	E	2	no probable risk (HQ values)	
DRC-1339, 98%, eggs/meat bait					
	California condor	E	1	no probable risk (HQ values)	
	bald eagle	T&E	1	no probable risk (HQ values)	
	San Joaquin kit fox	E	1	no probable risk (HQ values)	

(Continued)

Table 4-12 (Continued)

Conclusions for Threatened and Endangered Species From the Risk Assessment and USFWS Biological Opinions, by Formulation

Pesticide	Potentially Affected Species	Status [a]	Hazard Type [b]	Risk Assessment	U.S. Fish & Wildlife Service Biological Opinions
	grizzly bear	T	1	no probable risk (HQ values)	
	gray wolf	E	1	no probable risk (HQ values)	
	jaguarundi	E	1	no probable risk (HQ values)	
	ocelot	E	1	no probable risk (HQ values)	
Fenthion (BCF#1, 9%, and Rid-A-Bird, 11%)					
	bald eagle	E	2	no probable risk (HQ values)	
	peregrine falcon	E	2	no probable risk (HQ values)	
Strychnine (Avicides)					
	Attwater's greater prairie chicken	E	1	no probable risk (habitat)	
	whooping crane	E	1	no probable risk (habitat)	
	northern aplomado falcon	E	2	probable risk (chronic tox only)	
	bald eagle	T&E	2	probable risk (chronic tox only)	
	peregrine falcon	E	2	probable risk (chronic tox only)	may affect, no jeopardy (FWS 1992)
	jaguarundi	E	2	no probable risk (habitat)	
	ocelot	E	2	no probable risk (habitat)	
	Louisiana black bear	T	2	no probable risk (habitat)	
Rodenticides **Aluminum phosphide**					
	New Mexican ridge-nosed rattlesnake	T	1	probable risk	may affect, jeopardy (FWS 1989)
	Mexican gray wolf	E	1	no probable risk (habitat)	
Sodium nitrate gas cartridge for rodents					
	Fresno kangaroo rat	E	1	probable risk	may affect, no jeopardy (FWS 1992)
	giant kangaroo rat	E	1	probable risk	may affect, no jeopardy (FWS 1992)

(Continued)

Table 4-12 (Continued)

Conclusions for Threatened and Endangered Species From the Risk Assessment and USFWS Biological Opinions, by Formulation

Pesticide	Potentially Affected Species	Status [a]	Hazard Type [b]	Risk Assessment	U.S. Fish & Wildlife Service Biological Opinions
	Morro Bay kangaroo rat	E	1	probable risk	may affect, no jeopardy (FWS 1992)
	Stephens' kangaroo rat	E	1	probable risk	
	Tipton kangaroo rat	E	1	probable risk	may affect, no jeopardy (FWS 1992)
	salt marsh harvest mouse	E	1	probable risk	may affect, no jeopardy (FWS 1992)
	Point Arena mountain beaver	E	1	probable risk	
	black-footed ferret	E	1	no probable risk (label mitigation)	
	San Joaquin kit fox	E	1	no probable risk (label mitigation)	
	gray wolf	T	1	no probable risk (habitat)	
	New Mexican ridge-nosed rattlesnake	T	1	probable risk	may affect, jeopardy (FWS 1989)
	San Francisco garter snake	E	1	probable risk	may affect, no jeopardy (FWS 1992)
	blunt-nosed leopard lizard	E	1	no probable risk (label mitigation)	
	island night lizard	T	1	probable risk	
	gopher tortoise	T	1	no probable risk (label mitigation)	
	desert tortoise	T	1	probable risk	may affect, no jeopardy (FWS 1992)
	Santa Cruz long-toed salamander	E	1	probable risk	
Strychnine grain, above-ground use					
	Aleutian Canada goose	T	1	no probable risk (label mitigation)	may affect, no jeopardy (FWS 1992)
	whooping crane	E	1	probable risk	may affect, no jeopardy (FWS 1992)
	gray wolf	E	2	no probable risk (label mitigation)	
	bald eagle	E	2	probable risk (chronic tox)	may affect, jeopardy to Southwest population only (FWS 1992)

(Continued)

Table 4-12 (Continued)

Conclusions for Threatened and Endangered Species From the Risk Assessment and USFWS Biological Opinions, by Formulation

Pesticide	Potentially Affected Species	Status [a]	Hazard Type [b]	Risk Assessment	U.S. Fish & Wildlife Service Biological Opinions
	peregrine falcon	E	2	probable risk (chronic tox)	
Strychnine grain, below-ground use					
	ocelot	E	2	no probable risk (HQ values)	
	jaguarundi	E	2	no probable risk (HQ values)	
	gray wolf	E	2	no probable risk (label mitigation)	
	northern aplomado falcon	E	2	probable risk (chronic tox)	
	bald eagle	T&E	2	probable risk (chronic tox)	
	peregrine falcon	E	2	probable risk (chronic tox)	
Strychnine paste					
	whooping crane	E	1	probable risk	
	woodland caribou	E	1	no probable risk (habitat)	
	bald eagle	T&E	2	probable risk (chronic tox)	may affect, no jeopardy (FWS 1982)
	peregrine falcon	E	2	probable risk (chronic tox)	may affect, no jeopardy (FWS 1982)
	gray wolf	E	2	no probable risk (label mitigation)	
	grizzly bear	T	2	no probable risk (label mitigation)	
Strychnine salt block [c]					
	bald eagle	T	2	probable risk	
	peregrine falcon	E	2	probable risk	
	northern spotted owl	T	2	probable risk	
Zinc phosphide concentrate for mouse control					
	whooping crane	E	1	probable risk	
	woodland caribou	E	1	no probable risk (habitat)	
Zinc phosphide grain bait					
	whooping crane	E	1	no probable risk (label mitigation)	may affect, no jeopardy (FWS 1992)
	Aleutian Canada goose	T	1	probable risk	may affect, no jeopardy (FWS 1992)

(Continued)

Table 4-12 (Continued)

Conclusions for Threatened and Endangered Species From the Risk Assessment and USFWS Biological Opinions, by Formulation

Pesticide	Potentially Affected Species	Status [a]	Hazard Type [b]	Risk Assessment	U.S. Fish & Wildlife Service Biological Opinions
Predacides					
Sodium Cyanide M-44 capsules					
	California condor	E	1	probable risk	may affect, jeopardy (FWS 1992)
	San Joaquin kit fox	E	1	probable risk	may affect, no jeopardy (FWS 1992)
	jaguarundi	E	1	probable risk	
	ocelot	E	1	probable risk	
	gray wolf	E	1	probable risk	may affect, no jeopardy (FWS 1992)
	grizzly bear	T	1	probable risk	may affect, no jeopardy (FWS 1992)
Sodium Fluoroacetate (Compound 1080), livestock protection collar					
	ocelot	E	1	probable risk	
	jaguarundi	E	1	probable risk	
	bald eagle	E	1	probable risk	may affect, no jeopardy (1985)
Sodium Nitrate gas cartridge for coyotes					
	San Joaquin kit fox	E	1	no probable risk (label mitigation)	
	Utah prairie dog	T	1	no probable risk (habitat)	
	gray wolf	E	1	no probable risk (label mitigation)	
	black-footed ferret	E	1	no probable risk (habitat)	
	New Mexican ridge-nosed rattlesnake	T	1	no probable risk (habitat)	
	blunt-nosed leopard lizard	E	1	no probable risk (habitat)	may affect, no jeopardy (1992)
	desert tortoise	T	1	no probable risk (habitat)	
	San Francisco garter snake	E	1	no probable risk (habitat)	
	Wyoming toad	E	1	no probable risk (habitat)	

[a] Status: T = Threatened, E = Endangered, T&E = Threatened in some areas, endangered in other areas (bald eagle).
[b] The numbers represent the type of hazard, either primary (1) or secondary (2) for the listed species.
[c] This product has not been used since 1989, when APHIS ADC voluntarily cancelled it's registration.

Table 4-13

Summary of APHIS ADC Program Impacts for Chemical Methods with T&E Concerns

Active Ingredient/ Product name	Potentially Affected T&E Species	Impact Criteria: Magnitude[a]	Geographic Extent[b]	Duration[c]	Likelihood[d]	Impact Importance Rating[e]
Avicides						
4-Aminopyridine/Avitrol 0.5%						
	whooping crane	high	medium	medium	low	moderate
	Attwater's greater prairie chicken	high	high	medium	low	moderate
	Aleutian Canada goose	low	low	medium	low*	low
DRC-1339 (staging areas)						
	Attwater's greater prairie chicken	high	high	low	low	moderate
	whooping crane	high	low	low	low	moderate
Strychnine Corn Pigeon Bait, Strychnine Sparrow-cracks, and Strychnine Bird Toxicant						
	northern aplomado falcon	high	high	low	low	moderate
	bald eagle	moderate	low	low	low	low
	peregrine falcon	high	low	low	low	moderate
Rodenticides						
Aluminum Phosphide/Fumitoxin; Phostoxin; Detia-Rotox						
	New Mexican ridge-nosed rattlesnake	low	high	medium	low	low
Sodium Nitrate/Rodent Gas Cartridge						
	Fresno kangaroo rat	high	high	medium	low	moderate
	giant kangaroo rat	high	high	medium	low	moderate
	Morro Bay kangaroo rat	high	high	medium	low	moderate
	Stephens' kangaroo rat	high	high	medium	low	moderate
	Tipton kangaroo rat	high	high	medium	low	moderate
	salt marsh harvest mouse	high	high	medium	low	moderate
	Point Arena mountain beaver	high	high	medium	low	moderate
	New Mexican ridge-nosed rattlesnake	low	high	medium	low	low
	San Francisco garter snake	high	high	medium	low	moderate
	island night lizard	low	high	medium	low	low
	desert tortoise	low	low	medium	low	low
	Santa Cruz long-toed salamander	high	high	medium	low	moderate
Strychnine/Above Ground (0.35% & 0.5%)						
	whooping crane	high	low	medium	low	moderate
	bald eagle	moderate	low	medium	low	low
	peregrine falcon	high	low	medium	low	moderate

(Continued)

Table 4-13 (Continued)

Summary of APHIS ADC Program Impacts for Chemical Methods with T&E Concerns

Active ingredient/ Product name	Potentially Affected T&E Species	Impact Criteria: Magnitude[a]	Geographic Extent[b]	Duration[c]	Likelihood[d]	Impact Importance Rating[e]
Strychnine/Below Ground (0.35% & 0.5%)						
	northern aplomado falcon	high	high	medium	low	moderate
	bald eagle	moderate	low	medium	low	low
	peregrine falcon	high	low	medium	low	moderate
Strychnine Rabbit Paste (1.6%) and Strychnine Marmot Paste (4.9%)						
	whooping crane	high	low	low	low	moderate
	bald eagle	moderate	low	low	low	low
	peregrine falcon	high	low	low	low	moderate
Strychnine Salt Block (porcupine)						
	bald eagle	moderate	low	low	low	low
	peregrine falcon	high	low	low	low	moderate
	northern spotted owl	low	low	low	low	low
Zinc Phosphide Concentrate - Mouse						
	whooping crane	high	low	low	low *	moderate
ZP Rodent Bait AG (2%); D&H Formula Rid-R (2%); ZP rodent pellets (2%); Zinc Phosphide Oats (2%) and Zinc Phosphide on Wheat (1.82%)						
	Aleutian Canada goose	low	low	medium	low *	low
Predacides						
Sodium Cyanide/M-44 Cyanide Capsules						
	California condor	high	high	medium	low	moderate
	San Joaquin kit fox	high	high	medium	low	moderate
	jaguarundi	high	high	medium	low	moderate
	ocelot	high	high	medium	low	moderate
	gray wolf	moderate	medium	medium	low	low
	grizzly bear	low	high	medium	low	low
Sodium Fluoroacetate/Compound 1080						
	ocelot	high	medium	medium	low	moderate
	jaguarundi	high	medium	medium	low	moderate
	bald eagle	moderate	low	medium	low	low

[a] Magnitude of impact is associated with the size of the total species population and is derived from the category of listing under the Endangered Species Act as follows: high = endangered in all its range; moderate = endangered in only part of its range; low = threatened.

[b] Geographic extent was determined based on the percent of the range where the chemical is applied.

[c] This criterion was determined by the environmental persistence of the active ingredient following application.

[d] The likelihood of impact is low for all species because the rarity of the species and the limited distribution of the chemicals makes the likelihood of exposure very low. Species marked with an asterisk (*) are also in the range of the chemical application for a limited part of the year during migration.

[e] Impact Importance Rating refers to Table 4-1. The rating is independent of Jeopardy/No Jeopardy calls from the USFWS Biological Opinions. The combination of the impact rating and the Jeopardy/No Jeopardy calls indicate that additional label restrictions may be required to protect T&E species.

Following is a brief discussion of factors affecting the likelihood that impacts could occur in association with use of these materials.

For 4-Aminopyridine (gull concentrate), factors influencing overall nontarget impacts include:

- Due to extremely small quantities (up to 0.09 lb a.i.) and limited baiting areas, the magnitude of potential nontarget exposures is not significant.
- The product is applied in only two States (KY and TN), while nontarget receptors occur within many more States. Because the product is applied in a small fraction of the total range, the geographic extent of the impact is low.
- The product label adequately protects nontarget species by requiring the retrieval of bait and limiting use when nontargets are present.

Factors influencing overall nontarget impacts for DRC-1339 (feedlots, structures, and Starlicide Complete) include:

- Because of the small quantities and restrictive baiting practices used, the potential magnitude of impact is low (all three formulations).
- The product is applied in a quarter of all States (only eight for structures) with nontarget receptors occurring in more States; thus a fraction of the total range for nontargets makes the geographic extent low.
- DRC-1339 is not a persistent compound and is rapidly metabolized by target organisms, which would limit the duration of potential exposure.
- The product label for feedlot use adequately protects nontarget species by requiring the removal of unconsumed bait and limiting use when nontargets are present. For the structures formulation, prebaiting and bait removal are required.

Factors influencing overall nontarget impacts for fenthion (9% and 11%) include:

- Use patterns limit potential magnitude of impact because extremely small quantities (up to 1 gal annually) limit exposure.
- The formulations are applied in only two States, while the nontarget receptors occur in many more States, representing only a small fraction of the total range.
- Fenthion is not a persistent compound and therefore duration would be highly limited.
- Product labels provide restrictions which serve to protect potentially vulnerable nontarget species by surveying for nontargets (HI only) and removing carcasses promptly (both HI and KY).

Factors influencing overall nontarget impacts for zinc phosphide (for control of muskrats and nutria) include:

- Use patterns limit potential magnitude of impact because extremely small quantities (up to 0.2 lb annually) and specific use limit exposures;
- The formulation is applied in three States, while the nontarget receptors occur in many more States, representing only a small fraction of the total range;
- Product labels provide restrictions which serve to protect nonlisted, nontarget species by prebaiting, removing bait and carcasses.

Because of the above considerations and because there are no T&E species concerns, population impacts to nonlisted, nontarget receptors are expected to be negligible. None of the affected nontarget species is rare, and effects upon individual organisms do not

constitute impacts to overall species abundance or biological diversity. Accordingly, these "potential risk" products, based on risk assessment findings, are designated as having no significant impact.

Products for which HQ values exceeded one (1) with T&E species concerns

There are 19 formulated products or groups of products for which risk assessment designation was "potential risk", in part based on indicator species intended to represent potential nontarget exposures to such products (Table 4-13). The details for derivation of these results are provided in Appendix P. Specific chemical methods include:

- 4-aminopyridine (0.5% formulation), potentially affecting Aleutian Canada goose, Attwater's greater prairie chicken, and whooping crane.
- DRC-1339 (staging areas), potentially affecting Attwater's greater prairie chicken, and whooping crane.
- Strychnine corn pigeon bait, Sparrow Cracks, and Bird Toxicant, potentially affecting bald eagle, northern aplomado falcon, and peregrine falcon.
- 0.5% strychnine steam rolled oats (SRO) and 0.35% strychnine milo, above-ground, potentially affecting whooping crane, bald eagle, peregrine falcon, Aleutian Canada goose, and gray wolf.
- 0.5% strychnine (SRO) and 0.35% strychnine milo, below-ground, potentially affecting ocelot, jaguarundi, gray wolf, northern aplomado falcon, bald eagle, and peregrine falcon.
- 1.6% and 4.9% strychnine paste, potentially affecting whooping crane, bald eagle, and peregrine falcon.
- 5.79% strychnine salt block, potentially affecting bald eagle, peregrine falcon, and northern spotted owl.
- Aluminum phosphide, potentially affecting New Mexican ridge-nosed rattlesnake.
- Sodium nitrate, gas cartridge for rodents, potentially affecting kangaroo rats, salt marsh harvest mouse, Point Arena mountain beaver, New Mexican ridge-nosed rattlesnake, San Francisco garter snake, island night lizard, desert tortoise, and Santa Cruz long-toed salamander (nine species).
- Zinc phosphide
  - Concentrate for mouse control, potentially affecting whooping crane
  - ZP Rodent Bait 2% zinc phosphide AG formulation, D&H Formula Rid-R, ZP Rodent Pellets, 2% zinc phosphide (SRO) and 2% zinc phosphide wheat, potentially affecting Aleutian Canada goose.
- Sodium cyanide (M-44 cyanide capsules), potentially affecting California condor, San Joaquin kit fox, jaguarundi, ocelot, gray wolf, and grizzly bear.
- Sodium fluoroacetate (Compound 1080), potentially affecting jaguarundi, ocelot, and bald eagle.

The purpose of this section is to interpret the findings of the risk assessment in light of evaluating overall program impacts. In so doing, the "potential risk" products were subjected to a rigorous analysis of the criteria for determining impacts (see Table 4-1), including magnitude, duration, geographic extent, and likelihood. Table 4-13 presents this analysis on a product-by-product basis.

While the risk assessment, which may be less sensitive to protective measures taken by APHIS ADC or other personnel to reduce nontarget exposures, may indicate that all of the above products cause nontarget hazards (i.e., "potential risk" products), there are circumstances for these materials which may serve to reduce potential impacts. Specific examples follow:

- A listed species (for example, the bald eagle) may occur in many more States than those in which control measures (for example, using strychnine) are carried out, which serves to limit the geographic extent of the potential impact on the species.
- The toxicological mode of action may be delayed, for example, with DRC-1339 the lethal response of target birds requires several hours to take effect. The peregrine falcon will only be attracted to affected target birds before they die. This important toxicological consideration serves to limit the duration of potential impacts.
- Because of the inherent scarcity of T&E species, the likelihood of exposure may be further reduced.
- Because of the limited persistence of most of the APHIS ADC chemical methods in the environment (see Table 4-9), the duration of potential exposure may be further limited.
- For most of the chemical methods, as noted by the risk assessment, secondary exposures are inconsequential because of low secondary toxicity, low magnitude of use, low likelihood of exposure, and low geographic extent.

Based on all these considerations and the systematic analysis described above, the overall impact rating for all present APHIS ADC chemical methods is low or moderate for all APHIS ADC chemical methods. As noted in Table 4-1, use of APHIS ADC chemical methods would not result in significant adverse impacts.

In addition to overall impact ratings, Table 4-13 shows the specific threatened or endangered species potentially affected by each chemical method. For those methods designated as moderate impact suggested measures to mitigate these potential impacts are described in Appendix P and Chapter 5.

c. Impacts on Species Diversity

No APHIS ADC activities are conducted for the purpose of extirpating a species. The APHIS ADC program operates in accordance with international, national, and State laws and regulations enacted to ensure species maintenance and viability. As discussed previously, diversity is related to the number of animal species in a specific area and can be affected only if the occurrence of one or more species is substantially changed. The APHIS ADC program generally does not attempt eradication of wildlife populations. Eradication is a minor but integral component of the current program that could be employed as a damage management strategy in specific local cases.

Eradication may be an achievable goal only in limited cases, such as on islands or in isolated areas where the target species population is confined to a relatively small, well-defined area. When successful, such efforts result in an immediate decrease in species diversity. However, the elimination of an introduced predator or competing species may produce a long-term increase in the abundance of other species or could possibly lead to an increase in species diversity.

The only recent eradication effort involving the APHIS ADC program was completed in 1986 on Kiska Island, AK. The introduced arctic fox was negatively impacting the endangered Aleutian Canada goose by preying on eggs, goslings, and adult nesting geese. Other species on Kiska (rock ptarmigan and a variety of petrels) also were heavily preyed upon by arctic foxes. In response to a request from the USFWS, APHIS ADC used single

lethal dose, compound 1080 and diphacinone baits under USEPA permits to eradicate the arctic fox from Kiska Island. This eradication effort has afforded long-term protection to the Aleutian Canada goose and other species.

Any eradication of local populations of native species usually would be temporary, because immigrants from other populations would soon replace the animals removed. The impacts of the present APHIS ADC program on species diversity are not significant.

d. Impacts on Species Abundance

The current APHIS ADC program, as described in Chapters 1 and 2, uses an IPM approach in the control of wildlife damage to agricultural resources and structures and facilities, and threats to public health and safety. The IPM approach may include the use of both lethal and nonlethal methods, as described in Appendix J. The use of lethal methods results in direct impacts in the form of animal deaths. The analysis of APHIS ADC program impacts on species includes all APHIS ADC program impacts, though the analysis for each species is presented under the resource that sustained the most damage by that species.

The analysis of current program impacts is based primarily on FY 1988 data. For purposes of this EIS, FY 1988 is considered to be a representative or "snapshot" year typical of APHIS ADC program activities. FY 1988 was the most recent year for which complete data were available at the time of the original analysis. Updated loss and take data are presented in Appendix I for comparative purposes. Table 4-14 presents total numbers of target and nontarget species killed by the APHIS ADC program nationwide during FY 1988. Many numbers in Table 4-14 differ from corresponding values in the DEIS (Table 4-9). The differences represent corrected data obtained after the DEIS was issued.

Despite numerous advances in the field of wildlife damage management, the leghold trap invented centuries ago is still an important method of capturing coyotes in sheep-raising areas.

Table 4-14

Target and Nontarget Species Killed by the APHIS ADC Program Nationwide in FY 1988[a]

Species	Number of Target Individuals Killed in FY 1988	Number of Nontarget Individuals Killed in FY 1988
Mammals		
Armadillo	10	1
Badger	882	609
Bat species	28	0
Bear, black	275	3
Beaver	8,537	28
Beaver, mountain	16	0
Boar, Russian	192	5
Bobcat	1,158	54
Cat, domestic	178	56
Coyote	75,869	17
Deer species	2	184
Dog, domestic	151	393
Fox, arctic	9	0
Fox, gray	669	766
Fox, kit	3	128
Fox, red	4,057	231
Fox, swift	0	23
Goat, feral	0	2
Gopher species	8	0
Hog, feral	393	17
Jackrabbit species	176	185
Marmot species	258	0
Mink	3	3
Mountain lion	192	6
Mouse, house	2	0
Muskrat	253	61
Nutria	612	21
Opossum	3,402	499
Otter, river	1	17
Peccary (javelina)	0	764
Porcupine	947	783
Prairie dog species	124,292 [b]	0
Pronghorn (antelope)	0	3
Rabbit, cottontail	8	47
Rabbit species	2	0
Raccoon	4,054	1,023
Rat, black	146	0

(Continued)

Table 4-14 (Continued)

Target and Nontarget Species Killed by the APHIS ADC Program Nationwide in FY 1988[a]

Species	Number of Target Individuals Killed In FY 1988	Number of Nontarget Individuals Killed in FY 1988
Rat, Norway	177	0
Rat, roof	80	0
Rat species	51	0
Ringtail	1	68
Rodent, commensal [c]	48	0
Skunk, hognose	14	0
Skunk, spotted	37	0
Skunk, striped	8,154	8
Skunk species [d]	1,903	96
Squirrel, Eastern fox	12	2
Squirrel, gray	4	0
Squirrel, ground species	184	3
Vole species	1	0
Weasel species	0	1
Wolf, gray (timber)	53	0
Woodchuck	6	0
Woodrat species (packrat)	0	2
Other	56	17
Birds		
Blackbird group	3,687,583	2
Coot, American	47	0
Cormorant, double-crested	44	0
Crow, fish	80	0
Crow species	15	9
Duck, Muscovy	2	0
Egret, cattle	6,620	0
Egret, great	71	0
Egret, snowy	38	0
Gull species	60	0
Grebe, horned	1	0
Grebe, pied-billed	4	0
Hawk/Falcon species	26	1
Heron, black-crowned night	7	0
Heron, great blue	32	0
Heron, green	6	0
Heron, little blue	82	0
Heron species	6	0

(Continued)

Table 4-14 (Continued)

Target and Nontarget Species Killed by the APHIS ADC Program Nationwide in FY 1988[a]

Species	Number of Target Individuals Killed in FY 1988	Number of Nontarget Individuals Killed in FY 1988
Kingfisher, belted	0	1
Magpie, black-billed	81	0
Mallard	1	0
Mannikin, nutmeg (ricebird)	2	0
Meadowlark, Eastern	0	1
Owl species	1	4
Pelican, white	1	0
Pigeon (rock dove)	7,980	0
Quail species	5	0
Raven species	302	2
Roadrunner	0	3
Robin	0	1
Shore bird, unidentified	0	1
Sparrow, house	740	0
Sparrow species	60	0
Starling, European	1,012,242	0
Swallow/Martin species	3	0
Thrasher, pearly-eyed	0	1
Turkey, wild	0	3
Upland game birds	290	0
Vulture species	314	20
Woodpecker, pileated	1	0
Woodpecker species	1	0
Other birds	0	168
Reptiles and Others		
Alligator	0	2
Fish, unidentified	0	1
Rattlesnake species	0	2
Reptiles, unidentified	6	0
Turtle, snapping	0	9
Turtle species	0	68

[a] Data compiled from the FY 1988 APHIS ADC State annual reports.

[b] 124,292 prairie dogs were estimated to have been killed (Table 4-20) but only 538 were recovered and tallied in State annual reports. Most prairie dogs died underground and were not counted.

[c] Includes house mouse, Norway rat, and black rat.

[d] Primary striped skunk, but species were not identified in APHIS ADC reports.

Although the number of species affected is large, relatively few individuals of most species are killed. The following analysis discusses the impacts of the current APHIS ADC program on the 17 major target species, as defined previously. Each species is discussed under the protected resource category it most often is associated with or under the first resource of several affected. Under additional resources affected by the species, only the new impacts are discussed. Potential impacts on wildlife, including T&E species, are discussed later. The significance of program impacts on all 17 species is summarized in the Summary of Biological Impacts section and the conclusions presented in Table 4-31.

(1) Species That Damage Field Crops and Fruits and Nuts

Of the species primarily responsible for damage to field crops and fruits and nuts during FY 1988, the blackbird, starling, badger, nutria, opossum, porcupine, prairie dog, raccoon, and striped skunk are the principal target species. Impacts of APHIS ADC program direct control activities on the abundance of these target species are described in this section.

(a) Blackbird Group

The predominant members of the blackbird group (Subfamily Icterinae) include red-winged, tricolored, yellow-headed, rusty, and Brewer's blackbirds; common, boat-tailed, and great-tailed grackles; and brown-headed and bronzed cowbirds. At times, the starling (Family Sturnidae) is mistakenly reported as a member of the blackbird group.

In FY 1988 the APHIS ADC program killed 3,687,583 blackbirds in nine States. Kentucky and Tennessee accounted for nearly 90 percent of this total. The number of kills by State were 2,917,320 in Kentucky, 403,200 in Tennessee, 246,000 in North Dakota, 89,458 in Arizona, 15,000 in Mississippi, 9,839 in Washington, 4,837 in Texas, 1,848 in Pennsylvania, 80 in Georgia, and one in Louisiana.

Blackbird population levels have been relatively stable or have slightly increased over time, as reported in the USFWS Breeding Bird Survey (BBS) (USDI undated). Mean number of birds per route of red-winged blackbirds and grackles did not change significantly from 1966-69 to 1978-81 (Dolbeer and Stehn 1983); however, these species showed significant changes within certain regions. As Dolbeer and Stehn report indicates, the Northeast region recorded significant increases in red-winged blackbird populations from 1966-69 to 1978-81. The overall increase in the Northeast region mainly was the result of a 66 percent increase of the population in the St. Lawrence Valley. Increases of 41 to 111 percent also occurred in the mid-south and lower Mississippi Valley area. Declines were recorded in southern New England, northern Appalachian areas, and northern Montana.

The red-winged blackbird is the most numerous and widely distributed blackbird species in the United States (Webb and Royall 1970). Relative to other bird populations in the United States, the blackbird group has some of the highest populations, ranging from a low of about 500 million in winter at the end of the annual cycle (Royall 1977), to a high of over 1 billion during the summer months at the peak of the breeding season (Dolbeer, R.A., personal communication, October 2, 1989). The red-winged blackbird is by far the most common bird recorded in North America on the USFWS BBS routes for 1966-79. The starling is ranked third, the common grackle is ranked fifth, and the brown-headed cowbird is ranked thirteenth (Dolbeer and Stehn 1983). A red-winged blackbird model has been developed by Dolbeer *et al.* (1976). It uses the existing Breeding Density Information Retrieval System, a population dynamics model, and the Movement Information Retrieval System to evaluate the relationships between population numbers, reproductive rates, mortality rates, and the age class distribution at weekly intervals throughout the year. The annual reproductive rate used in the simulations is 2.43 young fledged per breeding adult female surviving the entire nesting season. The adult survival of the red-winged blackbird is estimated using banding data, which indicate that approximately 56 to 65 percent of adult males and females return on an annual basis to their breeding

grounds. This dynamic model can be used to estimate the numerical effect of any lethal control procedure on a bird population and to evaluate probable numerical population impacts associated with various levels of control. The model is used to evaluate the results of various kill conditions using the existing red-winged blackbird population data obtained from the BBS (Robbins and Van Velzen 1969). Three population scenarios are described in the following paragraphs.

Population Scenario 1. In this scenario, which includes only natural population dynamics and no additional mortality from the APHIS ADC program, the red-winged blackbird model is used for a geographic area extending from latitude 30° N. to 60° N. and longitude 67° W. to 101° W. This area covers the major range of the red-winged blackbird east of the Rocky Mountains. The red-winged blackbird model indicates that at the start of the nesting season (May), a total of 218,638,770 red-winged blackbirds are present within the geographic study area. At the end of the fledgling period (July), the total number of living red-winged blackbirds is estimated at 432,233,080, an increase over the start of the nesting season (97.7 percent). At the end of the annual cycle (the following May), the total number of birds surviving is 219,472,374, a decrease in population of 50.7 percent from the seasonal peak of the previous July. At the end of the annual cycle, the blackbird population is approximately 100.4 percent of the population size occurring at the start of the nesting season (the previous May) (Table 4-15).

Based on this simulation, the natural annual mortality rate for fledged red-winged blackbirds is 65.7 percent of the entire juvenile population. The adult natural mortality is 40.0 percent. This natural population dynamics scenario indicates the magnitude of natural mortality and the extreme annual population fluctuation that occurs for the red-winged blackbird under natural conditions. In addition, it represents conditions that probably would occur under the No Action Alternative, Nonlethal Control Program Alternative and Damage Compensation Program Alternative described in this EIS.

Population Scenario 2. Scenario 2 adds APHIS ADC program kills to the natural population dynamics represented in scenario 1. The difference in scenario 2 is that a January kill of 4,000,000 red-winged blackbirds was imposed following the seasonal peak population. This figure represents the approximate number of blackbirds killed by the APHIS ADC program during FY 1988. As in scenario 1, a total of 218,638,770 red-winged blackbirds are present within the geographic study area at the start of the nesting season (May).

At the peak of the fledgling period (July), the total number of living red-winged blackbirds is estimated at 432,233,080 birds, an increase over the start of the nesting season of 97.7 percent. At the end of the annual cycle (the next May), the total number of birds surviving is 216,526,060, a decrease in population of 50.09 percent from the seasonal peak of July (Table 4-15).

Removal of the 4,000,000 blackbirds resulted in a total population decrease from the beginning to the end of the annual cycle of 2,112,710 birds, or a decrease in the total population of 0.97 percent in May (Table 4-15). The reduction in population considers that birds not killed would continue to produce fledglings at the same rate without APHIS ADC kills. The removal of the 4,000,000 birds in scenario 2 results in approximately the same population level as modeled in scenario 1 without control kills. The APHIS ADC kill of 4,000,000 birds amounts to less than 1 percent of the entire red-winged blackbird population for the geographical area modeled and would have a minimal impact on that population.

The results obtained in the scenario 2 model suggest that the current APHIS ADC blackbird damage control program has a minimal impact on the blackbird population in the large geographic area east of the Rocky Mountains. During FY 1988 the APHIS ADC program level of kill had an extremely low impact on blackbird populations at the national level. The total number of blackbirds (all species) killed by the APHIS

ADC program amounts to only 1.69 percent of the population of red-winged blackbirds at the beginning of the nesting season in May (using BBS data). The APHIS ADC program kill of 3,697,583 blackbirds accounts for 0.85 percent of the entire red-winged blackbird population at the peak of the population cycle in July. The APHIS ADC program kill accounts for approximately 1.68 percent of the total red-winged blackbird population at the end of the annual cycle (the following May). This level of kill represents an even lower percentage of the total blackbird population that died during the year from all causes.

The large natural annual population fluctuations that occur in blackbird species are orders of magnitude higher than the fluctuations due to APHIS ADC program activities. Also, the areas where the APHIS ADC program kills the largest numbers of blackbirds are the areas where these depredating species roost and congregate in the largest numbers.

Table 4-15

Red-Winged Blackbird Population Modeling Results for Scenarios With and Without the Removal of Birds by the APHIS ADC Program

	Scenario 1		Scenario 2		Scenario 3	
Seasonal Events	No Action[a]		APHIS ADC Kills (4,000,000 Birds)[b]		APHIS ADC Kills (4,000,000 birds from smaller geographic area)[c]	
	Population Numbers[d]	*Change (±percent)*[e]	*Population Numbers*	*Change (±percent)*	*Population Numbers*	*Change (±percent)*
Nesting Season Population (May, beginning of year)	218,638,770	0	218,638,770	0	123,053,761	0
Season Peak Population (July)	432,233,080	+197.7 percent	432,233,080	+197.7 percent	243,268,586	+197.6 percent
ADC Kill (In January)	None	None	4,000,000	0.93 percent of peak season population 1.82 percent of nesting season population 1.84 percent of end of season population	4,000,000	1.64 percent of peak season population 3.25 percent of nesting season population 3.32 percent of end of season population
End of Annual Cycle (Following May)	219,472,374	−50.7 percent of July peak population +100.4 percent of previous nesting season population	216,526,060	−50.09 percent of July peak population +99.03 percent of previous nesting season population	120,576,692	−49.56 percent of July peak population +97.99 percent of previous nesting season population

[a] Scenario 1, natural conditions without any APHIS ADC program.
[b] Scenario 2, natural population fluctuations plus APHIS ADC program killing (4,000,000 birds).
[c] Scenario 3, natural population fluctuations plus APHIS ADC program killing (4,000,000 birds) from a smaller portion of the geographic range.
[d] Indicates the number of birds present based on the BBS results.
[e] Indicates the increase or decrease in the percentage of spring, peak, or end of season bird populations as indicated.

Population Scenario 3. To further evaluate the impact of the current APHIS ADC program on blackbirds, an analysis was performed for the Kentucky and Tennessee geographic area, where blackbird roosts present serious problems and where the APHIS ADC program kills the most birds. The area selected for modeling includes latitude 35° N. to 55° N. and longitude 75° W. to 95° W., which is the nesting area for most of the blackbirds that migrate to Kentucky and Tennessee during the fall and winter months. At the beginning of the breeding season, this area contained an estimated 123,053,761 red-winged blackbirds, based on BBS results. In July, at the peak of the breeding season, the population level rose to 243,268,586 red-winged blackbirds. An estimated 144,831,948 young were fledged.

The killing of 4,000,000 red-winged blackbirds in Kentucky and Tennessee is modeled to demonstrate the effect of this level of population reduction. The killing, as modeled, is conducted in the winter (January) and represents winter birds that are migrants from areas north of Kentucky and Tennessee. The birds killed in this scenario are migrants and represent a very large percentage of the total birds killed by the APHIS ADC program. As a result, the removal of 4,000,000 red-winged blackbirds from Kentucky and Tennessee has an even smaller effect on the blackbird population than the 3.32 percent of the total population indicated by the model. The total population at the start of the subsequent breeding season in May, after removal of the 4,000,000 birds, is 120,576,692 birds, 97.99 percent of the population level for the previous nesting season. This figure indicates an overall population decrease of 2,477,069 birds through both natural mortality and the APHIS ADC program kill. The reduction of the red-winged blackbird population by 4,000,000 birds accounts for a 3.32 percent decrease in the entire population at the end of the annual cycle in May in the area modeled. By comparison, during the same period, the adult mortality was 41.4 percent (inclusive of APHIS ADC program kills) and the juvenile mortality was 66.5 percent. Because red-winged blackbirds comprise only a fraction of the 3,320,520 blackbirds killed in Kentucky and Tennessee by the APHIS ADC program during FY 1988, the actual impact on the red-winged blackbird population is much smaller than indicated by the figures.

Based on the information provided in the preceding models, natural mortality levels of adult and fledgling birds are much higher than the APHIS ADC kill; therefore, the national magnitude rating for APHIS ADC program activities involving blackbirds is determined to be low (Table 4-31).

In FY 1988 the APHIS ADC program killed blackbirds in nine of the 49 States in which they occur. The geographic extent of this impact is determined to be low (Table 4-3, 4-31).

(b) European Starling

In FY 1988 the APHIS ADC program killed 1,012,242 starlings in seven States. This total includes 555,680 in Kentucky, 76,800 in Tennessee, 362,060 in Washington, 352 in Pennsylvania, 17,040 in Arizona, 300 in Mississippi, and 10 in New Hampshire. Relative to other bird populations in the United States, starlings are ranked as the third most common bird according to the USFWS BBS of 1966-87 (USDI undated).

BBS data show the national 20-year trend (1966-87) of starling populations to be basically stable; there was a less than 1 percent change per year. Analyses by regions, rather than by States, are the most meaningful way to examine population trends of birds because the boundaries of these geographical units are based on ecological differences. Dolbeer and Stehn (1983) reported that, on a regional basis, starlings showed significant increases in Upper and Lower Great Plains regions and the Northwest region from 1966-81. Starlings showed a rather consistent decline throughout northeast Appalachia and the southeastern United States during that time. This resulted primarily from a major decline in 1977-78, perhaps due to a severe winter. Population indices for 1980-81 suggest that the population was recovering from the substantial 1-year decline.

Robins (right) and starlings cause serious damage to ripening grapes in California and elsewhere

Because national population data show starling numbers to be stable or increasing and the birds are ranked as the third most common bird in the United States, it can be assumed that a large amount of control would be required to effect a measurable change in their population. Because the APHIS ADC program kill of starlings is so limited within States and regions of the country, the national magnitude for APHIS ADC activities involving starlings is determined to be low.

In FY 1988 the APHIS ADC program killed starlings in seven of the 49 States in which they occur. The geographic extent of this impact is determined to be low (Table 4-3).

(c) Badger

In FY 1988 the APHIS ADC program killed 1,491 badgers in 16 States. Badgers were killed primarily as target animals, but 609 were taken as nontargets (Table 4-14). Based on the most recent harvest data, the annual fur harvest in these States included an additional 19,492 badgers. Current population estimates are available for three of these States, and population trends are available for an additional seven States. No population data are available for the remaining six States. Table 4-16 presents a summary of available information on badger harvest, population data, and magnitude ratings by State.

An allowable harvest level is not available for the badger, so a qualitative assessment is used to determine the magnitude of total harvest. In the three States where population estimates are available, magnitude for total harvest is moderate. In the seven other States where population data are limited to population trends, magnitude for total harvest is moderate in five States and high in Oregon and California. In California the population is

decreasing because of the loss of habitat. The APHIS ADC program take in this State exceeds the fur harvest, but the total harvest is low and the level of harvest is not considered to be a contributing factor in the decline of the species. In Oregon the population trend is reported to be stable or decreasing, but the level of harvest is relatively low and comparable to harvest rates for adjoining States.

The magnitude for APHIS ADC program kill is low in eight States and moderate in Oregon and California. Magnitude is not rated for total harvest or APHIS ADC kill in the six States where population data are unavailable. The national magnitude rating for APHIS ADC program activities involving the badger is determined to be low (Table 4-31). In FY 1988 the APHIS ADC program killed badgers in 16 of the 25 States in which they occur. The geographic extent of this impact is determined to be moderate (Table 4-3).

Table 4-16

Badger: Magnitude of Total Harvest and ADC Program Kill for FY 1988

	Reported Harvest (FY 1988, unless noted)			*Current Population*		*Magnitude*	
State	APHIS ADC Kill[a]	Other Harvest[b,c]	Total Harvest[d]	Estimate	Trend[e]	Total Harvest[f]	APHIS ADC Kill[g]
Arizona	18	738 (87)	756	37,000	I/S	M	L
California	272	235	507		D	H	M
Colorado	25	2,795 (87)	2,820				
Idaho	11	568 (87)	579		S	M	L
Montana	36	2,108 (87)	2,144				
Nebraska	41	575	616		S	M	L
Nevada	62	366	428		S	M	L
New Mexico	140	942 (87)	1,082				
North Dakota	40	1,906 (84)	1,946				
Oklahoma	25	75	100		S	M	L
Oregon	477	687	1,164		S/D	H	M
South Dakota	68	3,411	3,479	65,200	S	M	L
Texas	187	1,633	1,820				
Utah	63	471	534				
Washington	24	169	193	20,000	S	M	L
Wyoming	2	2,813 (87)	2,815		S	M	L
Total	1,491	19,492	20,983				

[a] Target and nontarget species.

[b] For this column, FY 1988 represents the 1987-8 fur harvest season; (87) represents the 1986-87 fur harvest season; and (84) represents the 1983-84 fur harvest season.

[c] Information obtained from State wildlife management agencies.

[d] Total harvest is defined as the FY 1988 reported APHIS ADC program kill plus the most recent reported fur harvest.

[e] Population trends are indicated as: I = increasing, S = stable, or D = decreasing.

[f] Magnitude for total harvest is determined either quantitatively or qualitatively. Quantitative determinations are based on allowable harvest levels; qualitative determinations are based on population trends and used when data are unavailable to make quantitative determinations.

[g] Determination of magnitude for APHIS ADC kill is based on the fraction of total harvest attributed to APHIS ADC activities. L=Low, M=Moderate, H=High.

(d) Nutria

In FY 1988 the APHIS ADC program killed 633 nutria in four States. Nutria were killed primarily as target animals, but 21 were taken as nontargets (Table 4-14). Based on the most recent harvest data, the annual fur harvest in these States included an additional 920,073 nutria. A current population estimate is available for Mississippi, and the population trend is available for Oregon. No population data are available for the remaining two States. Table 4-17 presents a summary of available information on nutria harvest, population data, and magnitude ratings by State.

An allowable harvest level is not available for the nutria, so a qualitative assessment is used to determine the magnitude of total harvest. In Oregon, the only State where population trend data are available, the magnitude for total harvest is low. The magnitude for APHIS ADC program kill in Oregon is low. Magnitude is not rated for total harvest or APHIS ADC kill for the three States where population data are unavailable. The national magnitude rating for APHIS ADC program activities involving the nutria is determined to be low (Table 4-31).

In FY 1988 the APHIS ADC program killed nutria in four of the 14 States in which they occur. The geographic extent of this impact is determined to be low (Table 4-3).

Table 4-17

Nutria: Magnitude of Total Harvest and APHIS ADC Program Kill for FY 1988

	Reported Harvest (FY 1988, unless noted)			*Current Population*		*Magnitude*	
State	APHIS ADC Kill[a]	Other Harvest[b,c]	Total Harvest[d]	Estimate	Trend[e]	Total Harvest[f]	APHIS ADC Kill[g]
Louisiana	6	881,551 (84)	881,557				
Mississippi	14	1,602	1,616	<10,000			
Oregon	87	15,021	15,108		I	L	L
Texas	526	21,899	22,425				
Total	633	920,073	920,706				

[a] Target and nontarget species.

[b] For this column, FY 1988 represents the 1987-88 fur harvest season and (84) represents the 1983-84 fur harvest season.

[c] Information obtained from State wildlife management agencies.

[d] Total harvest is defined as the FY 1988 reported APHIS ADC program kill plus the most recent reported fur harvest.

[e] Population trends are indicated as: I = increasing, S = stable, or D = decreasing.

[f] Magnitude for total harvest is determined either quantitatively or qualitatively. Quantitative determinations are based on allowable harvest levels; qualitative determinations are based on population trends and used when data are unavailable to make quantitative determinations.

[g] Determination of magnitude for APHIS ADC kill is based on the fraction of total harvest attributed to APHIS ADC activities.

(e) Opossum

In FY 1988 the APHIS ADC program killed 3,901 opossums in 10 States. Opossums were killed primarily as target animals, but 499 were taken as nontargets (Table 4-14). Based on the most recent harvest data, the annual fur harvest in these States included an additional 464,718 opossums. Current population estimates are not available for any of the 10 States; however, population trend data are available in four States. Where population trend data are available, opossum numbers are either stable or increasing. Table 4-18 presents a summary of available information on opossum harvest, population data, and magnitude ratings by State.

An allowable harvest level is not available for the opossum, so a qualitative assessment is used to determine magnitude for total harvest. In the four States where population trend data are available, magnitude for total harvest is moderate, except in Oregon, where magnitude is low. The magnitude for APHIS ADC program kill is low in three States and moderate in California. Magnitude is not rated for total harvest or APHIS ADC kill for the six States where population data are unavailable. The national magnitude rating for APHIS ADC program activities involving the opossum is determined to be low (Table 4-31).

In FY 1988 the APHIS ADC program killed opossums in 10 of the 43 States in which they occur. The geographic extent of this impact is determined to be low (Table 4-3).

Table 4-18

Opossum: Magnitude of Total Harvest and APHIS ADC Program Kill for FY 1988

	Reported Harvest (FY 1988, unless noted)			*Current Population*		*Magnitude*	
State	APHIS ADC Kill[a]	Other Harvest[b]	Total Harvest[c]	Estimate	Trend[d,e]	Total Harvest[f]	APHIS ADC Kill[g]
California	1,999	879	2,978		S	M	M
Georgia	5	4,912 (84)	4,917				
Illinois	1	22,289 (84)	22,290				
Nebraska	48	4,409	4,457		I/S	M	L
New York	2	46,116	46,118				
Oklahoma	193	7,643	7,836		I/S	M	L
Oregon	773	3,143	3,916		I	L	L
Pennsylvania/New Jersey	1	>224,000	224,001				
Texas	879	151,327	152,206				
Total	3,901	464,718	468,619				

[a] Target and nontarget species.

[b] For this column, FY 1988 represents the 1987-88 fur harvest season and (84) represents the 1983-84 fur harvest season.

[c] Total harvest is defined as the FY 1988 reported APHIS ADC program kill plus the most recent reported fur harvest.

[d] Trend information obtained from State wildlife management agencies. No population data were available.

[e] Population trends are indicated as: I = increasing, S = stable, or D = decreasing.

[f] Magnitude for total harvest is based on population trends.

[g] Determination of magnitude for APHIS ADC kill is based on the fraction of total harvest attributed to APHIS ADC activities.

(f) Porcupine

In FY 1988 the APHIS ADC program killed 1,730 porcupines in 13 States. Porcupines were killed primarily as target animals, but 783 were taken as nontargets (Table 4-14). Because porcupines are not classed as furbearers or game animals, their populations are not closely monitored by State wildlife management agencies; therefore, data on porcupine harvest are unavailable in all States, but population trends are available for two States where porcupine numbers are increasing. Table 4-19 presents a summary of available information on porcupine harvest, population data, and magnitude ratings by State.

An allowable harvest level is not available for the porcupine, so a qualitative assessment is used to determine magnitude for APHIS ADC kill. There are few data available on which to base a qualitative assessment of the magnitude of APHIS ADC kill on porcupine populations. However, in the two States where population trends are available, the magnitude for APHIS ADC kill is low. Magnitude is not rated for total harvest or APHIS ADC kill for the 11 States where population data are unavailable. The national magnitude rating for APHIS ADC program activities involving the porcupine is determined to be low (Table 4-31).

In FY 1988 the APHIS ADC program killed porcupines in 13 of the 44 States in which they occur. The geographic extent of this impact is determined to be low (Table 4-3).

Table 4-19

Porcupine: Magnitude of APHIS ADC Program Kill for FY 1988

State	FY 1988 Reported APHIS ADC Kill[a]	Population Trend[b,c]	Magnitude of APHIS ADC Kill[d,e]
Arizona	7		
California	94		
Colorado	13		
Montana	10		
Nebraska	9		
New Mexico	385		
North Dakota	11		
Oklahoma	1		
Oregon	672		
South Dakota	10	I	L
Texas	467	I	L
Utah	29		
Washington	22		
Total	1,730		

[a]Target and nontarget species.

[b]Trend information obtained from State wildlife management agencies.

[c]Population trends are indicated as: I = increasing, S = stable, or D = decreasing.

[d]Magnitude for total harvest is based on population trends.

[e]Determination of magnitude for APHIS ADC kill is based on the fraction of total harvest attributed to APHIS ADC activities.

(g) Prairie Dog

In FY 1988 the APHIS ADC program killed an estimated 124,292 prairie dogs in four States (Table 4-20). The APHIS ADC program supervised prairie dog control activities in New Mexico, Oklahoma, Texas, and Nebraska, which accounted for 6,767 acres of land treated to control prairie dog damage (Table 4-20).

Because prairie dogs are prolific and natural mortality is high, it is difficult to assess population trends and mortality rates accurately. When treated with fumigants or following consumption of toxicants, prairie dogs tend to die in their burrows. This results in an underestimation of the number killed when the count is determined by carcasses found above ground. Therefore, APHIS ADC program personnel typically report only the acreage treated and do not determine the number of prairie dogs actually killed.

To facilitate a qualitative assessment of APHIS ADC program impacts on the abundance of prairie dogs, estimates are made of the numbers of prairie dogs potentially killed in each State. Because efficacy rates vary according to season, weather, location, bait acceptability, applicator, and other factors, an average efficacy rate for up to four methods is used to estimate the total number of prairie dogs killed. This number is determined by multiplying the total acres treated by the average density of prairie dogs by the average efficacy rate of the control methods used.

Table 4-20

Prairie Dog: Estimated FY 1988 APHIS ADC Program Kill

State	Reported Acreage Treated: Private/ Other Land	Federal/ Public Land	Total Treated	Prairie Dog Species	Average Population Density/ Acre[a]	Efficacy of Chemical Control Treatment[b] (percent)	Chemical Average Efficacy Rate[c] (percent)	APHIS ADC Reported Kill (shooting)	APHIS ADC Estimated Kill[d] (chemicals)
Nebraska	4,440	250	4,690	black-tailed	27	gas cartridge (50) zinc phosphide (80) aluminum phosphide (90) strychnine (80)	75	0	94,972
New Mexico	1,634	4	1,638	black-tailed/ Gunnison's	16	gas cartridge (50) zinc phosphide (80) aluminum phosphide (90)	73	92	19,132
Oklahoma	32	0	32	black-tailed	27	zinc phosphide (80) aluminum phosphide (90)	85	6	734
Texas	407	0	407	black-tailed	27	zinc phosphide (80) aluminum phosphide (90)	85	15	9,341[e]
Total	6,513	254	6,767					113	124,179

[a] Based on prairie dog studies conducted by Hoogland et al. 1987; Boddicker 1983; and Nowak and Paradiso 1983d; only accounts for adults and yearlings, not juveniles.

[b] Efficacy rate estimated by Boggess 1979; Brakke 1982; Boddicker 1983; and Moline and Demarais 1987.

[c] For this computation, it was assumed that equivalent amounts of each control material were applied over the same number of acres.

[d] Estimated kill = Total acreage treated x average density x average efficacy rate.

[e] Includes 425 that were recovered.

Average prairie dog densities were determined by reviewing the literature for typical numbers per acre for different species. Nebraska, Oklahoma, and Texas have only black-tailed prairie dogs *(Cynomys ludovicianus)*. This species has a density ranging from 4.8 to over 60 per acre (Hoogland et al. 1987; Boddicker 1983; Nowak and Paradiso 1983d). An average of 27 is used based on this information. New Mexico has both black-tailed and Gunnison's prairie dogs *(Cynomys gunnisoni)*. The Gunnison's prairie dog has an average density of 4.9 per acre (Nowak and Paradiso 1983d). The two figures (27 and 4.9) are averaged to determine 16 as the estimated density average for New Mexico.

Efficacy of treatment is determined by averaging the efficacy rate of the control methods used. In these four States, zinc phosphide on grain bait, fumigants such as aluminum phosphide and gas cartridges, and shooting were the methods used. An average efficacy rate was determined after consulting the literature (Boggess 1979; Brakke 1982; Boddicker 1983; Moline and Demarais 1987). Efficacy rates range from 50 to 100 percent, as shown in Table 4-20. These efficacy rates can be highly variable depending on the time of year of application, weather conditions, and, in the case of zinc phosphide, bait-shyness. The use of shooting for damage control is not calculated in the average efficacy rate, because this is a rarely used method and accounts for removal of very few prairie dogs.

Using this approach, the total number of prairie dogs killed under Federal supervision during FY 1988 was estimated to be 124,292 (Table 4-20). An allowable harvest rate is not available for prairie dogs, but they have been reported to recover to their original colony size within 1 year after removal of 75 percent of the population (Boddicker 1983). Assuming an allowable harvest rate of 75 percent, the removal of 9,341 prairie dogs from an estimated Texas population of 2,249,000 produces a harvest rate of 0.4 percent. Considering the limited number of acres treated in relation to the extensive range of prairie dogs, the level of control in the four States was minimal.

The magnitude for APHIS ADC program kill of prairie dogs in Texas is determined to be low. Magnitude is not rated for total harvest or APHIS ADC kill for the three States where population data are unavailable. The national magnitude rating for APHIS ADC program activities involving prairie dogs is determined to be low (Table 4-31).

In FY 1988 the APHIS ADC program killed prairie dogs in 4 of the 12 States in which they occur. The geographic extent of this impact is determined to be low (Table 4-3).

(h) Raccoon

In FY 1988 the APHIS ADC program killed 5,077 raccoons in 21 States. Raccoons were killed primarily as target animals, but 1,023 were taken as nontargets (Table 4-14). Based on the most recent harvest data, the annual fur harvest in these States included an additional 1,252,137 raccoons. Current population estimates are available for four of these States, and population trends are available for an additional 11 States. No population data are available for the remaining six States. Available population trends indicate that raccoons are stable or increasing in 13 States and decreasing in 2 States. Table 4-21 presents a summary of available information on raccoon harvest, population data, and magnitude ratings by State.

An allowable harvest level is available for the raccoon, so a quantitative assessment can be used to determine magnitude for total harvest. The allowable harvest level for the raccoon ranges from 49 to 59 percent; 49 percent was used in this analysis (Table 4-2). In three States where raccoon population estimates are available, the total harvest does not exceed 24 percent; therefore, the magnitude of total harvest in these States is low. In Nevada the total harvest was 3 percent, which also warrants a low magnitude rating; however, the reported long-term decline in the raccoon population would indicate either a high magnitude of harvest, high nonharvest mortality, or low reproduction. Uncertainty as to the cause of this reported decline precludes the assignment of a meaningful magnitude rating.

Table 4-21

Raccoon: Magnitude of Total Harvest and APHIS ADC Program Kill for FY 1988

	Reported Harvest (FY 1988, unless noted)			*Current Population*		*Magnitude*	
State	APHIS ADC Kill[a]	Other Harvest[b,c]	Total Harvest[d]	Estimate	Trend[e]	Total Harvest[f]	APHIS ADC Kill[g]
Arizona	5	834 (87)	839	113,000	S	L	L
California	1,557	3,790	5,347		S	M	M
Colorado	56	9,509 (87)	9,565				
Idaho	1	1,610 (87)	1,611		I	L	L
Georgia	16	62,141	62,157		S	M	L
Kentucky	5	25,033 (84)	25,038				
Minnesota	5	134,000	134,005		S/D	H	L
Montana	1	8,764 (87)	8,765		S	M	L
Nebraska	86	25,689	25,775		S	M	L
Nevada[h]	1	108	109	3,000-5,000	D		
New Mexico	72	1,712 (87)	1,784				
North Dakota	137	12,631 (84)	12,768				
Ohio	1	197,494 (84)	197,495				
Oklahoma	280	43,399	43,679		I/S	M	L
Oregon	342	10,418	10,760	88,400	S	L	L
Pennsylvania	1	>245,000	245,001				
South Dakota	372	35,409	35,781	147,540	S	L	L
Texas	2,110	419,848	421,958		S	M	L
Utah	12	2,629	2,641		I/S	M	L
Washington	12	7,000	7,012		I	L	L
Wyoming	5	5,119 (87)	5,124		I	L	L
Total	5,077	1,252,137	1,257,214				

[a] Target and nontarget species.

[b] For this column, FY 1988 represents the 1987-88 fur harvest season; (87) represents the 1986-87 fur harvest season; and (84) represents the 1983-84 fur harvest season.

[c] Information obtained from State wildlife management agencies.

[d] Total harvest is defined as the FY 1988 reported APHIS ADC program kill plus the most recent reported fur harvest.

[e] Population trends are indicated as: I = increasing, S = stable, or D = decreasing.

[f] Magnitude for total harvest is determined either quantitatively or qualitatively. Quantitative determinations are based on allowable harvest levels; qualitative determinations are based on population trends and used when data are unavailable to make quantitative determinations.

[g] Determination of magnitude for APHIS ADC kill is based on the fraction of total harvest attributed to APHIS ADC activities.

[h] Magnitude was not rated because of conflicting population data.

In the 11 States where population data are limited to population trends, a qualitative assessment is used to determine the magnitude of total harvest. In three States the magnitude of total harvest is low, in seven States the magnitude is moderate, and in Minnesota, where the population is decreasing slightly, the magnitude of total harvest is high. The magnitude for APHIS ADC program kill is low in 13 States and moderate in California. Magnitude is not rated for total harvest or APHIS ADC kill for the eight States where population data are unavailable. The national magnitude rating for APHIS ADC program activities involving the raccoon is determined to be low (Table 4-31).

In FY 1988 the APHIS ADC program killed raccoons in 21 of the 48 States in which they occur. The geographic extent of this impact is determined to be moderate (Table 4-3).

(i) Striped Skunk

In FY 1988 the APHIS ADC program killed 10,164 skunks of all species in 19 States. Skunks were killed primarily as target animals, but 104 were taken as nontargets (Table 4-14). Skunks were normally killed as targets because of the high incidence of rabies in the species. The striped skunk was the primary species taken, but a few spotted and hognose skunks were killed in New Mexico, Texas, and Oklahoma. The striped skunk is used for analysis in this EIS. Based on the most recent harvest data, the annual fur harvest in these States included an additional 178,184 striped skunks. Current population estimates are available for only 2 of these States, and population trends are available for an additional 10 States. No population data are available for the remaining seven States. Available population trends indicate that the striped skunk populations are stable or increasing in 12 States. Table 4-22 presents a summary of available information on striped skunk harvest, population data, and magnitude ratings by State.

An allowable harvest level is not available for the striped skunk, so a qualitative assessment is used to determine magnitude for total harvest. In all States where population trends are available, magnitude for total harvest is moderate, except in Nevada where magnitude is low.

The APHIS ADC program kill in California, which was much higher than any other State and higher than the 1987-88 California fur harvest, primarily occurred as corrective measures in response to urban damage or nuisance complaints. An additional consideration in these corrective measures was that all skunks captured by the APHIS ADC program in California were killed at the request of the California Department of Health Services, because skunks are the primary wildlife vectors for rabies in that State. During 1988 rabies was declared endemic to 50 of the 58 counties in California. Skunks were involved in 262 (68 percent) of the 383 cases of rabies involving wildlife.

The magnitude for APHIS ADC program kill is low in 10 States and moderate in California and Oklahoma. Magnitude is not rated for total harvest or APHIS ADC kill for the seven States where population data are unavailable. The national magnitude rating for APHIS ADC program activities involving the striped skunk is determined to be low (Table 4-31).

In FY 1988 the APHIS ADC program killed striped skunks in 19 of the 48 States in which they occur. The geographic extent of this impact is determined to be moderate (Table 4-3).

Table 4-22

Striped Skunk: Magnitude of Total Harvest and APHIS ADC Program Kill for FY 1988

	Reported Harvest (FY 1988, unless noted)			Current Population		Magnitude	
State	APHIS ADC Kill[a]	Other Harvest[b,c]	Total Harvest[d]	Estimate	Trend[e]	Total Harvest[f]	APHIS ADC Kill[g]
Arizona	67	2,537 (87)	2,604	452,000	S	M	L
California	5,929[h]	3,240	9,169		S	M	M
Colorado	119	24,723 (87)	24,842				
Georgia	2	3	5				
Louisiana	33[h]	10	43				
Minnesota	12[h]	54,000 (87)[h]	54,012		S	M	L
Montana	3	8,378 (87)	8,387		I/S	M	L
Nebraska	180[h]	1,190	1,370		S	M	L
Nevada	24	63	87		I	L	L
New Mexico	704[i]	2,835 (87)	3,539				
New York	1	16,301 (84)	16,302				
North Dakota	132[h]	181 (84)	313				
Oklahoma	631[h]	98	729		S	M	M
Oregon	829[h]	1,063	1,892		S	M	L
South Dakota	137[h]	2,478	2,615	190,050	S	M	L
Texas	1,297	53,595[j]	54,892				
Utah	15	2,416	2,431		S	M	L
Washington	45[h]	455	500		S	M	L
Wyoming	4	4,618 (87)	4,622		S	M	L
Total	10,164	178,184	188,348				

[a] Target and nontarget species.

[b] For this column, FY 1988 represents the 1987-88 fur harvest season; (87) represents the 1986-87 fur harvest season; and (84) represents the 1983-84 fur harvest season.

[c] Information obtained from State wildlife management agencies.

[d] Total harvest is defined as the FY 1988 reported APHIS ADC program kill plus the most recent reported fur harvest.

[e] Population trends are indicated as: I = increasing, S = stable, or D = decreasing.

[f] Magnitude for total harvest is determined either quantitatively or qualitatively. Quantitative determinations are based on allowable harvest levels; qualitative determinations are based on population trends and used when data are unavailable to make quantitative determinations.

[g] Determination of magnitude for APHIS ADC kill is based on the fraction of total harvest attributed to APHIS ADC activities.

[h] Primarily striped skunk, but some spotted skunk may have been killed.

[i] Primarily striped skunk, but some spotted and/or hognosed skunk may have been killed.

[j] Reported as "skunk;" no species given.

(2) Species That Damage Commercial Forests/Forest Products

In FY 1988 the animals primarily responsible for damage to timber, Christmas trees and conifer plantations, and ornamental or horticultural plantings included beavers, bears, deer, elk, gophers, and porcupines. Impacts of the APHIS ADC lethal control activities on the abundance of these target species are described in detail in this section. Direct impacts on porcupine abundance are discussed in the section, "Species That Damage Field Crops and Fruits and Nuts." As discussed earlier, impacts on other species responsible for damage are not discussed in detail because they were not killed as often, and impacts on the species discussed in this EIS are representative of all impacts.

(a) Beaver

In FY 1988 the APHIS ADC program killed 8,565 beavers in 19 States. Beavers were killed primarily as target animals, but 28 were taken as nontargets (Table 4-14). Based on the most recent harvest data, the annual fur harvest in these States included an additional 118,858 beavers. Current population estimates are available for only six States. Available population trends indicate that beavers are stable or increasing in all States. Table 4-23 presents a summary of available information on beaver harvest, population data, and magnitude ratings by State.

An allowable harvest level is available for the beaver, so a quantitative assessment can be used to determine magnitude for total harvest. The allowable harvest level for the beaver is 30 percent (Table 4-2). In the six States where beaver population estimates are available, the total harvest as a percentage of the estimated population is used to determine magnitude for total harvest. The total harvest in five of these States is at or below 12 percent; therefore, the magnitude of total harvest in these States is low. In Wisconsin the total harvest was 49 percent, which warrants a high magnitude rating; however, the increasing population trend would indicate a low magnitude of harvest. This contradiction suggests an error in population or harvest data and precludes the assignment of a meaningful magnitude rating. In the 10 States where population data are limited to population trends, a qualitative assessment is used to determine the magnitude of total harvest. In four States the magnitude of total harvest is low, and in six States the magnitude is moderate. The magnitude for APHIS ADC program kill in all States is low. Magnitude is not rated for total harvest or APHIS ADC kill for Colorado or New Mexico because population data are unavailable. The national magnitude rating for APHIS ADC program activities involving the beaver is determined to be low (Table 4-31).

In FY 1988 the APHIS ADC program killed beavers in 19 of the 49 States in which they occur. The geographic extent of this impact is determined to be moderate (Table 4-3).

(b) Black Bear

In FY 1988 the APHIS ADC program killed 278 black bears in nine States. Black bears were killed primarily as target animals, but three were taken as nontargets (Table 4-14). Based on the most recent available harvest data, the reported harvest for these nine States included an additional 7,108 black bears. Current population estimates are available for all nine States. Available population trends indicate that the black bear populations are stable in all nine States. Table 4-24 presents a summary of available information on black bear harvest, population data, and magnitude ratings by State.

An allowable harvest level is available for the black bear, so a quantitative assessment can be used to determine magnitude for total harvest. The allowable harvest level for the black bear is 20 percent (Table 4-2). Because population estimates are available in all nine States, the total harvest as a percentage of the estimated population is used to determine magnitude for total harvest. Total harvest for the black bear ranges from 4 to 12 percent; therefore, the magnitude of total harvest for each of the nine States is low (Table 4-31). The national magnitude rating for APHIS ADC program activities involving the black bear is determined to be low (Table 4-31).

Table 4-23

Beaver: Magnitude of Total Harvest and APHIS ADC Program Kill for FY 1988

	Reported Harvest (FY 1988, unless noted)			*Current Population*		*Magnitude*	
State	APHIS ADC Kill[a]	Other Harvest[b,c]	Total Harvest[d]	Estimate	Trend[e]	Total Harvest[f]	APHIS ADC Kill[g]
Arizona	1	129 (87)	130	4,100		L	L
California	232	1,230	1,462		I	L	L
Colorado	10	5,913 (87)	5,923				
Georgia	19	1,521	1,540		I/S	M	L
Indiana	8	12,918	12,926		I	L	L
Kentucky/Tennessee	282	1,218	1,500		I/S	M	L
Louisiana	19	288 (84)	307		I/S	M	L
Mississippi	84	12,952	13,036	150,000	I	L	L
Nebraska	26	3,435	3,461		I/S	M	L
Nevada	10	675	685		S	M	L
New Mexico	106	584 (87)	690				
North Dakota	486	5,344 (84)	5,830	50,000-100,000		L	L
Oklahoma	3,380	2,950	6,330		I	L	L
Oregon	157	8,295	8,452	68,000	I/S	L	L
South Dakota	576	2,417	2,993	32,536	S	L	L
Texas	2,759	5,494	8,253		I	L	L
Utah	2	4,725	4,727		S	M	L
Wisconsin[h]	408	48,770 (86)	49,178	100,000	I		
Total	8,565	118,858	127,423				

[a] Target and nontarget species.
[b] For this column, FY 1988 represents the 1987-88 fur harvest season; (87) represents the 1986-87 fur harvest season; (86) represents the 1985-86 fur harvest season; and (84) represents the 1983-84 fur harvest season.
[c] Information obtained from State wildlife management agencies.
[d] Total harvest is defined as the FY 1988 reported APHIS ADC program kill plus the most recent reported fur harvest.
[e] Population trends are indicated as: I = increasing, S = stable, or D = decreasing.
[f] Magnitude for total harvest is determined either quantitatively or qualitatively. Quantitative determinations are based on allowable harvest levels; qualitative determinations are based on population trends and used when data are unavailable to make quantitative determinations.
[g] Determination of magnitude for APHIS ADC kill is based on the fraction of total harvest attributed to APHIS ADC activities.
[h] Magnitude was not rated because of conflicting population data.

In FY 1988 the APHIS ADC program killed black bears in 9 of the 39 States in which they occur. The geographic extent of this impact is determined to be low (Table 4-3).

Table 4-24

Black Bear: Magnitude of Total Harvest and APHIS ADC Program Kill for FY 1988

	Reported Harvest (FY 1988, unless noted)			*Current Population*		*Magnitude*	
State	APHIS ADC Kill[a]	Other Harvest[b,c]	Total Harvest[d]	Estimate	Trend[e,f]	Total Harvest[g]	APHIS ADC Kill[h]
Arizona	6	159	165	2,000-3,500	S	L	L
California	35	1,359	1,394	12,000-15,000	S	L	L
Colorado	13	585	598	15,000	S	L	L
Idaho	32	2,100 (84)	2,132	25,000	S	L	L
Montana	36	1,277 (84)	1,313	25,000-30,000	S	L	L
New Mexico	1	316 (87)	317	3,000-3,500	S	L	L
Oregon	129	954 (87)	1,083	20,000-25,000	S	L	L
Utah	25	69	94	700-900	S	L	L
Wyoming	1	289 (87)	290	2,500-3,000	S	L	L
Total	278	7,108	7,386				

[a] Target and nontarget species.

[b] For this column, FY 1988 represents the 1987-88 hunter/trapper harvest season; (87) represents the 1986-87 hunter/trapper harvest season; and (84) represents the 1983-84 hunter/trapper harvest season.

[c] Information obtained from State wildlife management agencies.

[d] Total harvest is defined as the FY 1988 reported APHIS ADC program kill plus the most recent reported hunter/trapper harvest.

[e] Population trends are indicated as: I = increasing, S = stable, or D = decreasing.

[f] U.S. Forest Service trends for the black bear indicate populations are moderately increasing in the North, Southeast, and Midwest; they are stable or slightly increasing on the Pacific Coast (Flather and Hoekstra in press).

[g] Magnitude for total harvest is based on allowable harvest levels.

[h] Determination of magnitude for APHIS ADC kill is based on the fraction of total harvest attributed to APHIS ADC activities.

(3) Impacts of Other Forest/Forest Products Protection Activities

In most States, the State wildlife management agency, rather than the APHIS ADC program, responds to deer damage complaints by issuing depredation permits to landowners, building fences, loaning control devices, or providing advice or compensation. The APHIS ADC program provides technical assistance to Federal and State agencies or individuals with damage complaints or refers them to appropriate agencies. The APHIS ADC program has negligible impacts on the abundance of deer populations.

Technical assistance is provided to reforestation programs and for the control of rodent damage to maple sap tubing and sugarbushes. The APHIS ADC program has negligible impacts on the abundance of these species.

Lethal control methods may be applied by APHIS ADC personnel to control damage caused by gophers and squirrels, but so few gophers and squirrels are killed by the APHIS ADC program that no significant impacts occur. The USDA FS engages in extensive control efforts to manage mountain beaver and pocket gopher damage.

(4) Species That Damage Grazing Lands and Other Agricultural Resources

Many animals damage grazing lands and other agricultural resources. Prairie dogs, beavers, and badgers account for most of the losses and are the principal target species of APHIS ADC program direct control activities. Direct impacts on prairie dogs, badgers, and beavers are discussed in the sections, "Species That Damage Field Crops and Fruits and Nuts" and "Species That Damage Commercial Forests/Forest Products." The APHIS ADC program is not requested to provide much direct control to protect grazing lands, and only three State APHIS ADC program offices recorded damage to this resource.

Losses of feedlot grain primarily are caused by blackbirds and starlings. APHIS ADC program impacts on these bird species are discussed in the section, "Species That Damage Field Crops and Fruits and Nuts."

Black bears, striped skunks, and raccoons damage beehives. The APHIS ADC program impacts on these species are discussed in the sections, "Species That Damage Field Crops and Fruits and Nuts" and "Species That Damage Commercial Forests/Forest Products."

(5) Species That Damage Aquaculture and Mariculture

Many species of birds damage aquacultural and maricultural resources. Cormorants, herons, and egrets are the principal target species of APHIS ADC program efforts to control damage to aquacultural resources. Cormorants and gulls are the principal target species of control activities conducted to protect maricultural resources. The APHIS ADC program role in dealing with these damage problems is primarily technical assistance.

Technical assistance activities may impact target species because the USFWS may issue depredation permits to producers based on recommendations by the APHIS ADC program. Such recommendations are made after an evaluation determines that lethal methods are necessary to supplement nonlethal methods of damage control. Nonlethal control measures (e.g., propane cannons) may scare birds from nesting areas near certain ponds, but these actions are not known to have substantial impacts.

(6) Species That Damage Livestock and Poultry

This section discusses program impacts on the abundance of five target species—the coyote, bobcat, mountain lion, red fox, and gray fox—that are taken primarily to protect sheep, goats, calves, swine, and poultry. The coyote accounts for most livestock losses and is the main target species of most western State APHIS ADC programs. Many other animal species also damage domestic livestock, as discussed in Chapter 3.

These rainbow trout at a commercial hatchery in Idaho suffered injuries from a great blue heron.

(a) Coyote

In FY 1988 the APHIS ADC program killed 75,886 coyotes in 22 States. Coyotes were killed primarily as target animals, but 17 were taken as nontargets (Table 4-14). Based on the most recent harvest data, the annual fur harvest in these States included an additional 352,799 coyotes. Current population estimates are available for most of the States, and population trends are available for all but two of the States. Available trends indicate that coyote populations are stable or increasing over all of the United States. Table 4-25 presents a summary of available information on coyote harvest, population data, and magnitude ratings by State.

An allowable harvest level is available for the coyote, so a quantitative assessment can be used to determine magnitude for total harvest. The allowable harvest level for the coyote is 70 percent (Table 4-2). In the States where population estimates are available, the total harvest as a percentage of the estimated population is used to determine magnitude for total harvest. The total harvest ranges from 2 to 35 percent in the 11 States where population estimates are available; therefore, the magnitude of total harvest for these States is low. In the 10 States where population data are limited to population trends, a qualitative assessment is used to determine magnitude for total harvest. In three States the magnitude of total harvest is low, and in seven States the magnitude is moderate. The magnitude rating for APHIS ADC program kill in all States is low (Table 4-31). Magnitude is not rated for total harvest or APHIS ADC kill for Louisiana because population data are unavailable. The national magnitude rating for APHIS ADC program activities involving the coyote is determined to be low (Table 4-31).

In FY 1988 the APHIS ADC program killed coyotes in 22 of the 49 States in which they occur. The geographic extent of this impact is determined to be moderate (Table 4-3).

Table 4-25

Coyote: Magnitude of Total Harvest and APHIS ADC Program Kill for FY 1988

	Reported Harvest (FY 1988, unless noted)			Current Population		Magnitude	
State	APHIS ADC Kill[a]	Other Harvest[b,c]	Total Harvest[d]	Estimate	Trend[e]	Total Harvest[f]	APHIS ADC Kill[g]
Arizona	1,335	12,334 (87)	13,669	257,771		L	L
California	7,769	68,500	76,269	400,000	I/S	L	L
Colorado	3,063	37,277 (87)	40,340		S	M	L
Idaho	3,648	7,093 (87)	10,741		S	M	L
Illinois	24	9,650 (87)	9,674		S	M	L
Louisiana	1		1				
Minnesota	17	7,000	7,017	20,000 (85)	S	L	L
Mississippi	2	44,786	44,788	210,000	S	L	L
Montana	4,393	13,550 (87)	17,943		I	L	L
Nebraska	1,538	6,773	8,311	75,000-100,000	S	L	L
Nevada	4,782	6,373	11,155	>50,000	S	L	L
New Mexico	5,003	20,549 (87)	25,552		S	M	L
New York	2	1,403 (84)	1,405	4,000	S	L	L
North Dakota	2,124	1,000 (87)	3,124	25,000	S	L	L
Ohio	9	118 (87)	127	5,000-7,000	I/S	L	L
Oklahoma	3,700	5,890	9,590		I/S	M	L
Oregon	6,749	10,072	16,821	150,000	I	L	L
South Dakota	2,906	8,705	11,611	71,020	I	L	L
Texas	17,561	69,083	86,644		I	L	L
Utah	4,853	6,934	11,787		I	L	L
Washington	681	6,330	7,011		I/S	M	L
Wyoming	5,726	9,379 (87)	15,105		I/S	M	L
Total	75,886	352,799	428,685				

[a] Target and nontarget species.

[b] For this column, FY 1988 represents the 1987-88 fur harvest season; (87) represents the 1986-87 fur harvest season; and (84) represents the 1983-84 fur harvest season.

[c] Information obtained from State wildlife management agencies.

[d] Total harvest is defined as the FY 1988 reported APHIS ADC program kill plus the most recent reported fur harvest.

[e] Population trends are indicated as: I = increasing, S = stable, or D = decreasing.

[f] Magnitude for total harvest is determined either quantitatively or qualitatively. Quantitative determinations are based on allowable harvest levels; qualitative determinations are based on population trends and used when data are unavailable to make quantitative determinations.

[g] Determination of magnitude for APHIS ADC kill is based on the fraction of total harvest attributed to APHIS ADC activities.

(b) Bobcat

In FY 1988 the APHIS ADC program killed 1,212 bobcats in 13 States. Bobcats were killed primarily as target animals, but 54 were taken as nontargets (Table 4-14). Based on the most recent available harvest data, the annual fur harvest in these States included an additional 54,641 bobcats. Current population estimates are available for eight States, and population trends are available for all States. Available population trends indicate that bobcat populations are stable or increasing. Table 4-26 presents a summary of available information on bobcat harvest, population data, and magnitude ratings by State.

An allowable harvest level is available for the bobcat, so a quantitative assessment is used to determine magnitude for total harvest. The allowable harvest level for the bobcat is 20 percent (Table 4-2). In the eight States where population estimates are available, the total harvest as a percentage of the estimated population is used to determine magnitude for total harvest. The total harvest ranges from 2 to 15 percent. Based on the allowable harvest

Table 4-26

Bobcat: Magnitude of Total Harvest and APHIS ADC Program Kill for FY 1988

	Reported Harvest (FY 1988, unless noted)			*Current Population*		*Magnitude*	
State	APHIS ADC Kill[a]	Other Harvest[b,c]	Total Harvest[d]	Estimate	Trend[e]	Total Harvest[f]	APHIS ADC Kill[g]
California	47	8,994	9,041	70,000-75,000 (80-81)	S	L	L
Colorado	3	1,501	1,504		S	M	L
Idaho	2	1,023 (87)	1,025		S	M	L
Montana	3	1,305 (87)	1,308	8,000-10,000	I/S	M	L
Nevada	3	1,458	1,461	20,000	I/S	L	L
New Mexico	75	2,724	2,799		S	M	L
North Dakota	2	17 (84)	19	600-1,000	S	L	L
Oklahoma	5	3,452 (84)	3,457	25,000	S	L	L
Oregon	49	4,451	4,500	30,000	I/S	M	L
South Dakota	1	140	141	2,022	S	L	L
Texas	1,002	27,031	28,033		S	M	L
Utah	12	1,023	1,035		I	L	L
Wyoming	8	1,522 (87)	1,530	11,000	S	L	L
Total	1,212	54,641	55,853				

[a] Target and nontarget species.

[b] For this column, FY 1988 represents the 1987-88 fur harvest season; (87) represents the 1986-87 fur harvest season; and (84) represents the 1983-84 fur harvest season.

[c] Information obtained from State wildlife management agencies.

[d] Total harvest is defined as the FY 1988 reported APHIS ADC program kill plus the most recent reported fur harvest.

[e] Population trends are indicated as: I = increasing, S = stable, or D = decreasing.

[f] Magnitude for total harvest is determined either quantitatively or qualitatively. Quantitative determinations are based on allowable harvest levels; qualitative determinations are based on population trends and used when data are unavailable to make quantitative determinations.

[g] Determination of magnitude for APHIS ADC kill is based on the fraction of total harvest attributed to APHIS ADC activities.

criteria in Table 4-2, the magnitude of total harvest is low in six States and moderate in Oregon and Montana. In the five States where population data are limited to population trends, a qualitative assessment is used to determine magnitude for total harvest. Magnitude for total harvest is moderate in four States and low in Utah. The magnitude for APHIS ADC program kill in all States is low. The national magnitude rating for APHIS ADC program activities involving the bobcat is determined to be low (Table 4-31).

In FY 1988 the APHIS ADC program killed bobcats in 13 of the 47 States in which they occur. The geographic extent of this impact is determined to be low (Table 4-3).

(c) Mountain Lion

In FY 1988 the APHIS ADC program killed 198 mountain lions in 11 States. Mountain lions were killed primarily as target animals, but six were taken as nontargets (Table 4-14). Based on the most recent harvest data, the reported annual harvest in these States included an additional 1,929 mountain lions. Current population estimates are available for nine States. Population trends are reported to be stable or increasing for all States. Table 4-27 presents a summary of available information on mountain lion harvest, population data, and magnitude ratings by State.

An allowable harvest level is available for the mountain lion, so a quantitative assessment is used to determine magnitude for total harvest. The allowable harvest level for the mountain lion is 30 percent (Table 4-2). In the nine States where population estimates are available, the total harvest as a percentage of the estimated population is used to determine magnitude for total harvest. The total harvest ranges from less than 1 to 28 percent. Based on the allowable harvest criteria in Table 4-2, the magnitude of total harvest in eight States is low and in Utah is moderate. In New Mexico and Texas, where population data are limited to population trends, a qualitative assessment is used to determine the magnitude of total harvest. In both States the magnitude of total harvest is moderate. The magnitude for APHIS ADC program kill in all States except Texas is low. In Texas the magnitude for APHIS ADC program activities is not rated because of the lack of data on harvest by others. The national magnitude rating for APHIS ADC program activities involving the mountain lion is determined to be low (Table 4-31).

In FY 1988 the APHIS ADC program killed mountain lions in 11 of the 14 States in which they occur. The geographic extent of this impact is determined to be high (Table 4-3).

(d) Red Fox

In FY 1988 the APHIS ADC program killed 4,288 red foxes in 15 States. Red foxes were killed primarily as target animals, but 231 were taken as nontargets (Table 4-14). Based on the most recent available harvest data, the annual fur harvest in these States included an additional 199,858 red foxes. Current population estimates are available for only three States. Population trends are available for 11 of the 15 States. Available trend data indicate that red fox populations are stable or increasing for most States but may be decreasing in Montana. Table 4-28 presents a summary of available information on red fox harvest, population data, and magnitude ratings by State.

An allowable harvest level is available for the red fox, so a quantitative assessment can be used to determine magnitude for total harvest. The allowable harvest level for the red fox is 70 percent (Table 4-2). In the three States where population estimates are available, the total harvest as a percentage of the estimated population is used to determine magnitude for total harvest. The total harvest ranges from 14 to 35 percent. Based on the allowable harvest criteria in Table 4-2, the magnitude of total harvest in these States is low.

In the nine States where population data are limited to population trends, a qualitative assessment is used to determine the magnitude of total harvest. Magnitude for total harvest is moderate in Montana and Nebraska, and low in the remaining seven States. The magnitude for APHIS ADC program kill in all States is low. Magnitude is not rated for total

Table 4-27

Mountain Lion: Magnitude of Total Harvest and APHIS ADC Program Kill for FY 1988

	Reported Harvest (FY 1988, unless noted)			*Current Population*		*Magnitude*	
State	APHIS ADC Kill[a]	Other Harvest[b,c]	Total Harvest[d]	Estimate	Trend[e]	Total Harvest[f]	APHIS ADC Kill[g]
Arizona	14	206	220	2,500	S	L	L
California	32	0	32	5,000-6,000	I	L	L
Colorado	13	107	120	2,000-3,000	I/S	L	L
Idaho	4	327	331	1,900	I/S	L	L
Montana	3	148 (84)	151	1,500-2,000	I/S	L	L
New Mexico	8	95 (87)	103		S	M	L
Nevada	41	236	277	1,200-1,500	I	L	L
Oregon	12	168	182	2,200	I	L	L
Texas[h]	40	(i)	40		S	M	
Utah	28	247	275	900-1,100	S	M	L
Washington	1	121[j]	122	1,500	S	L	L
Total	198	1,929	2,127				

[a] Target and nontarget species.

[b] For this column, FY 1988 represents the 1987-88 sport harvest season; (87) represents the 1986-87 sport harvest season; and (84) represents the 1983-84 sport harvest season.

[c] Information obtained from State wildlife management agencies.

[d] Total harvest is defined as the FY 1988 reported APHIS ADC program kill plus the most recent reported sport harvest.

[e] Population trends are indicated as: I = increasing, S = stable, or D = decreasing.

[f] Magnitude for total harvest is determined either quantitatively or qualitatively. Quantitative determinations are based on allowable harvest levels; qualitative determinations are based on population trends and used when data are unavailable to make quantitative determinations.

[g] Determination of magnitude for APHIS ADC kill is based on the fraction of total harvest attributed to APHIS ADC activities.

[h] Magnitude for total harvest is based on population trend; magnitude for APHIS ADC kill is not rated because data for other harvest are not reported in Texas.

[i] Unprotected species; harvest unreported.

[j] 89 legal and 32 illegal kills.

harvest or APHIS ADC kill for three States because population data are unavailable. The national magnitude rating for APHIS ADC program activities involving the red fox is determined to be low (Table 4-31).

In FY 1988 the APHIS ADC program killed red foxes in 15 of the 48 States in which they occur. The geographic extent of this impact is determined to be low (Table 4-3).

Table 4-28

Red Fox: Magnitude of Total Harvest and APHIS ADC Program Kill for FY 1988

	Reported Harvest (FY 1988, unless noted)			*Current Population*		*Magnitude*	
State	**APHIS ADC Kill** [a]	**Other Harvest** [b,c]	**Total Harvest** [d]	**Estimate**	**Trend** [e]	**Total Harvest** [f]	**APHIS ADC Kill** [g]
Alaska	2 [h]		2				
Colorado	26	2,558 (87)	2,584				
California	99	0 [i]	99		I	L	L
Idaho	52	3,257 (87)	3,309		I	L	L
Montana	540	8,468 (87)	9,058		S	M	L
Nebraska	77	577	654		I/S	M	L
New Mexico	7	819 (87)	826				
North Dakota	498	40,000 (87)	40,498	115,000		L	L
Minnesota	10	90,000	90,010		I	L	L
Ohio	7	15,719 (87)	15,726		I	L	L
Oregon	223	782	1,005	7,200	S	L	L
South Dakota	1,054	15,240	16,294	86,190	I	L	L
Texas	602	10,263	10,865		I	L	L
Utah	148	2,554	2,702		I	L	L
Wyoming	893	9,621 (87)	10,514		I	L	L
Total	4,288	199,858	204,146				

[a] Target and nontarget species.
[b] For this column, FY 1988 represents the 1987-88 fur harvest season and (87) represents the 1986-87 fur harvest season.
[c] Information obtained from State wildlife management agencies.
[d] Total harvest is defined as the FY 1988 reported APHIS ADC program kill plus the most recent reported fur harvest.
[e] Population trends are indicated as: I = increasing, S = stable, or D = decreasing.
[f] Magnitude for total harvest is determined either quantitatively or qualitatively. Quantitative determinations are based on allowable harvest levels; qualitative determinations are based on population trends and used when data are unavailable to make quantitative determinations.
[g] Determination of magnitude for APHIS ADC kill is based on the fraction of total harvest attributed to APHIS ADC activities.
[h] FY 1987 data are used because FY 1988 kill data are unavailable.
[i] No fur harvest.

(e) Gray Fox

In FY 1988 the APHIS ADC program killed 1,435 gray foxes in seven States. Almost equal numbers were killed as target and nontarget animals (Table 4-14). Based on the most recent available harvest data, the annual fur harvest in these States included an additional 89,572 gray foxes. Current population estimates are available for Arizona and Oregon, and population trends are available for an additional four States. Available trend data indicate that gray fox populations are stable. Table 4-29 presents a summary of available information on gray fox harvest, population data, and magnitude ratings by State.

An allowable harvest level is available for the gray fox, so a quantitative assessment can be used to determine magnitude for total harvest. The allowable harvest level for the gray fox is 25 percent (Table 4-2). In Arizona and Oregon the total harvest as a percentage of the estimated population is used to determine magnitude for total harvest. The total harvest for these States is 11 and 4 percent, respectively. Based on the allowable harvest criteria in Table 4-2, the magnitude of total harvest in these States is low. In the four States where population data are limited to population trends, a qualitative assessment is used to determine the magnitude of total harvest. The magnitude of total harvest is moderate in

Table 4-29

Gray Fox: Magnitude of Total Harvest and APHIS ADC Program Kill for FY 1988

	Reported Harvest (FY 1988, unless noted)			*Current Population*		*Magnitude*	
State	APHIS ADC Kill[a]	Other Harvest[b,c]	Total Harvest[d]	Estimate	Trend[e]	Total Harvest[f]	APHIS ADC Kill[g]
Arizona	7	16,010 (84)	16,017	140,000		L	L
California	155	11,270	11,425		S	M	L
New Mexico	120	5,987 (87)	6,107				
Oklahoma	3	1,547	1,550		S	M	L
Oregon	4	351	355	8,500	S	L	L
Texas	1,144	52,766	53,910		S	M	L
Utah	2	1,641	1,643		S	M	L
Total	1,435	89,572	91,007				

[a] Target and nontarget species.

[b] For this column, FY 1988 represents the 1987-88 fur harvest season; (87) represents the 1986-87 fur harvest season; and (84) represents the 1983-84 fur harvest season.

[c] Information obtained from State wildlife management agencies.

[d] Total harvest is defined as the FY 1988 reported APHIS ADC program kill plus the most recent reported fur harvest.

[e] Population trends are indicated as: I = increasing, S = stable, or D = decreasing.

[f] Magnitude for total harvest is determined either quantitatively or qualitatively. Quantitative determinations are based on allowable harvest levels; qualitative determinations are based on population trends and used when data are unavailable to make quantitative determinations.

[g] Determination of magnitude for APHIS ADC kill is based on the fraction of total harvest attributed to APHIS ADC activities.

these four States. The magnitude for APHIS ADC program kill in all States is low. Magnitude is not rated for total harvest or APHIS ADC kill for New Mexico because population data are unavailable. The national magnitude rating for APHIS ADC program activities involving the gray fox is determined to be low (Table 4-31).

In FY 1988 the APHIS ADC program killed gray foxes in 7 of the 46 States in which they occur. The geographic extent of this impact is determined to be low (Table 4-3).

(7) Species That Damage Facilities and Structures

Many mammals and birds cause damage to facilities and structures, including commercial and residential buildings, property (utilities, telephone poles, fences, and automobiles/ equipment), and recreational areas (golf courses, lawns, pools, and reservoirs). (For a complete description of such damage, see Chapter 3.) The economic value of damage to facilities and structures is significant; however, in many situations the problem is one of nuisance wildlife rather than actual economic loss due to wildlife damage. The APHIS ADC program deals with damage to facilities and structures by technical assistance and, as needed, direct control.

Animals that damage facilities and structures include raccoons, skunks, opossums, commensal rodents, Canada geese, and woodpeckers. Technical assistance usually is sufficient to resolve damage or nuisance situations involving commensal rodents, Canada geese, and woodpeckers. However, in California and Texas direct control is frequently provided to resolve these damage and nuisance problems for both urban and rural residents. In these States, substantial numbers of opossums, raccoons, and skunks are killed by APHIS ADC program efforts (see Tables 4-18, 4-21, and 4-22, respectively). However, as shown in the section, "Species That Damage Field Crops and Fruits and Nuts," the magnitude of APHIS ADC program impacts on these species is low.

(8) Species That Affect Public Health and Safety

An important APHIS ADC program effort in the area of public health and safety is to reduce aviation hazards due to excessive bird and mammal presence or activity at airports. Both technical assistance and direct control are used. When direct control is used, the objective is reduction in target species abundance near the airport. Short-term, local impacts result from such reduction. Technical assistance usually results in the use of hazing or scaring tactics to move animals and keep them from the aircraft hazard zone. Such activities do not produce significant adverse impacts.

The APHIS ADC program also assists public health agencies in monitoring and limiting the spread of zoonotic diseases transmissible to humans. As discussed in Chapter 3, the primary wildlife species responsible for dissemination of diseases transmissible to humans or livestock include the coyote, gray fox, striped skunk, bat, blackbird, starling, pigeon, gull, and goose. The coyote, gray fox, striped skunk, blackbird, and starling are the principal target species of present APHIS ADC program efforts to assist with the control of zoonotic diseases. These species are considered individually in previous sections of this chapter.

(a) Cattle Egret

Cattle egrets are common in Hawaii and the southeastern United States. Large concentrations of this species at airport facilities constitute a significant collision hazard for air traffic in these areas. APHIS ADC assistance activities work to reduce bird hazards at airports operated by the Hawaii Department of Transportation. The APHIS ADC program is also involved in cooperative Bird Airstrike Hazard (BASH) control assistance with the U.S. Air Force in Hawaii.

In FY 1988 the APHIS ADC program killed 6,620 cattle egrets. All but four of these were killed in Hawaii; all were target animals.

According to the USFWS BBS (USDI undated), cattle egret populations increased at a rate of 2 percent per year during 1966-87. A large increase has occurred in Hawaii. Considering this increase, APHIS ADC direct control activities do not appear to be adversely impacting the cattle egret population.

Because cattle egret populations are reported to be increasing in the areas where APHIS ADC control activities occurred, the national magnitude rating for APHIS ADC program activities involving cattle egrets is determined to be low (Table 4-31).

In FY 1988 the APHIS ADC program killed cattle egrets in two of the 43 States in which they occur. The geographic extent of this impact is determined to be low (Table 4-3).

(9) Program Impacts on Other Target Species

Biological impacts on the 17 major target species are presented in previous sections. Those species were selected for detailed treatment because they are killed in relatively high numbers by the APHIS ADC program or otherwise are objects of public concern. In addition to those 17 species, approximately 60 other species were killed as target animals in FY 1988 (Table 4-14). The low numbers killed have no significant impact on overall abundance of any of these species. As with major target species, there may be locally significant, short-term impacts.

e. Impacts on Wildlife Species That Are Not Threatened or Endangered

Preceding sections of this EIS have considered the impacts of APHIS ADC program actions on the abundance of target species (i.e., species against which control actions are directed to reduce damage caused by wildlife). However, the program also impacts wildlife in several other ways. These impacts are described in this section.

Some wildlife species may be the focus of program efforts to protect them from other wildlife species. Others may benefit indirectly from control work aimed at protecting livestock or other resources. Negative biological impacts also can occur, either directly or indirectly. The main direct negative impacts of APHIS ADC program activities are on nontarget animals (i.e., animals killed, captured, or otherwise injured by control methods that are not selective for target species). Indirect negative impacts can result in several ways, as described in the following sections.

(1) Wildlife Species as Protected Resources

The APHIS ADC program occasionally is requested to assist other government agencies charged with protecting wildlife resources. In FY 1988 the APHIS ADC program was involved in several projects to protect waterfowl or waterfowl habitat. In Tennessee and Kentucky beavers were trapped and beaver dams were removed with explosives to protect bottomland hardwoods used by waterfowl for food and cover. In Nebraska APHIS ADC program employees removed coyotes from the Valentine National Wildlife Refuge to control damage to nesting waterfowl.

The APHIS ADC program provided assistance to the Maryland Department of Forest, Park, and Wildlife Service and the city of Bowie, MD. City employees were trained in the use of pyrotechnics to scare waterfowl from a pond where Muscovy ducks were infected with duck viral enteritis. The pyrotechnics were used to keep other birds out of the pond until it was decontaminated and declared safe.

Eggs and nestlings of the greater sandhill crane (USFWS species of special concern) were protected from coyotes, ravens, and raccoons at Malheur National Wildlife Refuge, Oregon, under a cooperative agreement with the USFWS. Protection from predators was essential to meet refuge objectives for crane production and survival.

Using cooperative funding, the APHIS ADC program in South Dakota purchased live traps and made them available to the public, sportsman clubs, and conservation officers for trapping raccoons and skunks in prime pheasant nesting habitat. This technical assistance effort was intended to increase pheasant abundance in the area. Technical assistance also was provided to control depredation on Atlantic salmon smolts and commercial fishes by cormorants in the lower Penobscot River in Maine and to control cormorant depredation on coho salmon smolts released annually in the Lamprey River in New Hampshire, for the New Hampshire Fish and Game Department.

Wherever APHIS ADC program efforts to protect wildlife achieve the desired effects, the impacts on protected species are positive.

(2) Indirect Positive Impacts on Wildlife

APHIS ADC program activities can have positive impacts on animals that are either target or nontarget species. Direct control to protect crops or livestock can benefit wildlife species locally. For example, removal of coyotes from a sheep range could reduce coyote predation not only on sheep but also on deer, antelope, or other wildlife in the area. Increased survival of mule deer fawns in Arizona (McMichael 1970) and Utah (Robinette et al. 1977; Austin et al. 1977) has been reported where coyote populations were reduced to protect livestock. Starling removal to protect fruit crops or cattle feedlots is reported to also benefit native, cavity-nesting birds by reducing starling competition for nest sites. Most indirect benefits of APHIS ADC program activities are not documented and existing information is inadequate to estimate the overall magnitude or extent of such benefits.

Documentation is available for another type of indirect positive impact, namely, increases of competing predator species when coyote populations are reduced. Significant increases in bobcat, skunk, badger, raccoon, and red fox numbers have been recorded following coyote population reductions (Linhart and Robinson 1972; Wagner 1972; Nunley 1978; Sargeant 1982). Characterization of such increases as positive impacts requires the assumption that population increases are desirable. Skunk population increases probably would not be desirable in regions where rabid skunks pose hazards to public health (MacInnes 1987). Increased numbers of red fox could be desirable in the eyes of fur trappers interested in higher pelt harvests, but undesirable to waterfowl managers concerned about increased red fox predation on nesting ducks (Sargeant 1978).

(3) Impacts on Nontarget Species

Direct impacts on nontarget species occur when APHIS ADC program personnel inadvertently kill, injure, or harass animals that are not target species. In general, these impacts result from the use of methods that are not completely selective for target species. Fewer nontarget than target animals are killed by every control method, but some methods are more selective than others. The numbers of nontarget animals killed by the APHIS ADC program in FY 1988 are presented in Table 4-14. Most were taken by traps, snares, or M-44 sodium cyanide ejectors used in predator control, particularly in coyote damage control.

Consideration of the number and species of nontarget animals killed indicates that most have behavioral characteristics similar to those of the target species. For example, nontarget canids may be caught in traps set for coyotes, because the nontarget species have similar food preferences and often are attracted to trap lures or baits used to attract target predators. APHIS ADC field personnel devote substantial effort to minimizing nontarget captures through careful selection of sites where capture devices are set and by developing and using selective lures. In addition, part of the APHIS ADC research effort is devoted to improving the selectivity of capture techniques such as traps and snares.

Injuries, death, or other impacts on animals can result from technical assistance. The magnitude of such impacts is unknown, because there are no uniform records on damage control efforts by persons who receive technical assistance. For most technical

assistance, the APHIS ADC program does not determine if recommended control measures were implemented properly or if they were effective. However, it is assumed that recipients of APHIS ADC technical assistance follow label or other applicable directions.

Other potential indirect APHIS ADC program impacts include secondary poisoning of nontarget species, exclusion of nontarget species from elements of their habitats, or reduction in prey species important to predators. Based on current information, it is impossible to quantify such impacts or even to determine if they have occurred. Other than nontarget poisoning, the potential for significant, adverse, indirect impacts is considered low.

Numbers of nontarget individuals killed during FY 1988 were small compared to the population size of each species. Population estimates are unavailable for most of these, but the numbers of nontarget individuals killed by the APHIS ADC program would be minimal compared to the numbers that die of other causes. Considering all factors, the impacts of APHIS ADC program kills on nontarget species population levels would not be significant.

f. Impacts on Threatened and Endangered Species

As described in Chapter 3, T&E species are plants and animals at risk of becoming extinct throughout all or part of their geographic range. Species can be federally listed under the ESA of 1973, State listed under State laws parallel to the ESA, or both. This EIS focuses mainly on federally listed species, but State-listed species receive equal attention at the State office level in planning and conducting APHIS ADC activities. The APHIS ADC program has no known adverse impacts on T&E plants, so this discussion is devoted to animals.

The APHIS ADC program may affect T&E species in several ways, as described in Chapter 3. T&E species may be intentionally (directly) or indirectly protected by APHIS ADC program activities, or they may be killed or captured as target species. Individuals of T&E species may be impacted negatively as nontarget species (see biological opinion Appendix F).

(1) Threatened and Endangered Species as Protected Resources

The APHIS ADC program is involved in several programs that directly protect or benefit federally or State-listed T&E species. Direct protection results from APHIS ADC program efforts to reduce predation on T&E species, including their eggs and young. Benefits may result from similarly directed technical assistance activities or from direct control to protect other crops or resources. The following paragraphs describe some APHIS ADC activities that benefit T&E species.

APHIS ADC personnel are actively involved in a few projects that benefit federally listed endangered mammal species. Coyotes are removed to protect the San Joaquin kit fox in California. Red foxes prey on the Perdido Key beach mouse in Alabama, where the APHIS ADC program has provided technical assistance to the USFWS and the National Park Service (NPS) in removing foxes from the 40-acre Perdido Key, which was then restocked with the mouse.

Most APHIS ADC program efforts on behalf of T&E species are conducted to protect birds. The roseate tern, a federally listed endangered species, nests in the same area as gulls in Maine, New York, and Massachusetts. In the 10 known roseate tern nesting areas, gull depredation of tern eggs has caused a significant reduction in the tern population. As a result, there has been a significant effort to reduce gull nesting success and to relocate gull nest sites from roseate tern nesting areas.

Bobcats and coyotes prey on the federally listed endangered Mississippi sandhill crane. The APHIS ADC program has provided technical assistance and instruction to USFWS personnel on procedures to control predator damage. USFWS conducted the control work, with the APHIS ADC program role limited to provision of technical assistance (including control materials).

APHIS ADC personnel in Texas are involved in the efforts that directly benefit three endangered species: the Attwater's greater prairie chicken, the brown pelican, and the black-capped vireo. All three are both federally and State listed as endangered. Prairie chickens and pelicans are damaged by coyote predation, and the vireo by nest parasitism by brown-headed cowbirds. The APHIS ADC program removes coyotes and cowbirds from critical areas at seasons important to reproduction or survival of the protected species.

In Gray's Lake National Wildlife Refuge, Idaho, the whooping crane (federally and State listed as endangered) is protected. With technical assistance from APHIS ADC personnel, the USFWS removed coyotes and other predators for several years. APHIS ADC also conducts projects to protect two federally designated endangered bird species in California. Red foxes are being removed to protect the lightfooted clapper rail; red foxes, skunks, raccoons, coyotes, opossums, ground squirrels, ravens, hawks, crows, and feral cats are being removed to protect the California least tern. In Hawaii three federally and State-listed bird species—the Hawaiian goose (nene), Hawaiian coot, and Hawaiian stilt—are damaged by mongoose predation. The DWRC has developed a new toxic bait to reduce mongoose numbers in areas inhabited by these species.

In Alaska the APHIS ADC program cooperated with the USFWS to test chemical methods for eradicating the introduced arctic fox from nesting islands in the Aleutian chain. Fox predation prevented the Aleutian Canada goose (federally listed as endangered) from nesting successfully on these islands. The APHIS ADC program also is assisting the USFWS with Norway rat control for the same purpose on selected Aleutian islands.

The APHIS ADC program has conducted work to protect a threatened reptile and an endangered mollusk. In Utah the APHIS ADC program was involved with the BLM in efforts to reduce coyote and raven predation on the desert tortoise. The predators were removed from critical habitat of this federally listed threatened species. The Louisiana pearlshell is both federally and State listed as endangered. Beaver dams slow stream velocity and cause silt to be deposited over the clam. The APHIS ADC program reduced this threat by trapping beavers and removing beaver dams in parts of central Louisiana.

These programs are integral parts of other wildlife management agencies' efforts to conserve T&E species. Overall, the impacts are positive because they help to maintain or increase populations of these species.

(2) Indirect Positive Impacts on Threatened and Endangered Species

APHIS ADC program actions to protect other resources also have the potential to benefit T&E species. Hypothetically, a threatened rodent such as the Utah prairie dog may occur in an area where sheep are being protected from coyote predation. Coyotes in the area may be preying on both sheep and prairie dogs. Therefore, coyote removal for sheep protection could reduce predation on the Utah prairie dog. At Buenos Aires National Wildlife Refuge in Arizona the masked bobwhite quail (federally and State listed as endangered) may be indirectly protected by APHIS ADC involvement in control work to protect the pronghorn antelope from coyotes. Removal of feral hogs in Hawaii to control hog damage to irrigation ditches may have a beneficial effect on T&E native plants and other vegetation that hogs also eat and damage.

(3) Threatened and Endangered Species as Target Species

T&E species can become target species of the APHIS ADC program for the same reasons that other species become target animals—they can present hazards or cause damage that is unacceptable to affected persons. The APHIS ADC program usually attempts to trap these animals and turn them over to the appropriate State wildlife agency for relocation or other disposition. However, this is not always possible, and animals occasionally are killed. Decisions to kill rather than relocate threatened or endangered animals, as well as individuals of other species of special concern, are made by the responsible Federal and State agencies.

The gray wolf is federally listed as threatened in Minnesota rather than endangered as in the other 47 contiguous United States. In 1988, the Minnesota wolf population contained an estimated 1550 to 1750 individuals, and wolf numbers were increasing. Gray wolves damage livestock, and the State of Minnesota compensates producers for livestock losses. Approximately $28,000 was paid in compensation during FY 1988. In addition, the APHIS ADC program is authorized to kill gray wolves, if needed, to prevent livestock losses. All actions are taken within Federal guidelines and in conformance with Federal court orders. In FY 1988, 53 gray wolves were killed in Minnesota, and 5 wolf pups were captured and released. The APHIS ADC program impact on wolf abundance is low.

The grizzly bear was the only other threatened target species taken by the APHIS ADC program during FY 1988 (Table 4-30). Three target grizzly bears were trapped and released—two in Idaho and one in Montana. All three were preying on livestock. The capture and release of these individuals by the APHIS ADC program is not considered to have a significant impact.

Table 4-30

Federal and State Threatened and Endangered Species Taken by the APHIS ADC Program in FY 1988

			Target Species		*Nontarget Species*	
Species	State	Status[a]	Killed	Released	Killed	Released
Gray Wolf	Minnesota	T	53	5		
Grizzly Bear	Idaho	T		2		1
	Montana	T		1		2
River Otter	Tennessee	ST			4	

[a] T = Federal threatened; ST = State threatened.

(4) Direct and Indirect Adverse Impacts on Nontarget Threatened and Endangered Species

Animals are considered nontarget species when they are unintentionally or inadvertently killed, injured, or harassed by APHIS ADC program activities. In FY 1988 no federally designated T&E species were killed as nontarget species (Table 4-30). However, four individuals of a State listed threatened species—the river otter—were killed in connection with beaver damage control in Tennessee. The only other direct effects to nontarget threatened species during FY 1988 resulted from inadvertent capture of three grizzly bears—one in Idaho and two in Montana. All three were released. The APHIS ADC program had no known significant adverse impacts on threatened or endangered species as nontarget species.

As described previously for wildlife species that are not threatened or endangered, there are several possible ways in which the APHIS ADC program could indirectly affect T&E species. Indirect impacts could occur as a result of secondary toxicity in conjunction with pesticide use or by reduction of a rodent species that constitutes an important part of the prey base for a threatened or endangered predator species. None of these potential scenarios has been known to occur. The APHIS ADC program has no known significant indirect impacts on threatened or endangered species.

(5) Program Actions to Avoid Adverse Impacts on Threatened and Endangered Species

Indirect impacts are difficult to quantify or even detect in many cases. However, by acknowledging potential adverse impacts on T&E species, the APHIS ADC program is able to avoid or at least limit the impacts. An objective of the program is to avoid stressing or killing T&E species. Such impacts are avoided by modification of control methods as necessary, or by not using certain methods where vulnerable T&E species occur. Techniques such as underpan springs to increase the weight required to spring a coyote trap are used to avoid catching smaller animals. The use of lethal methods may be avoided altogether if workable nonlethal techniques are available. Judicious use of control methods, as well as compliance with USEPA pesticide labeling and other Federal and State regulations, results in avoidance of significant adverse impacts on T&E species.

The APHIS ADC program has completed a Section 7 Consultation with the USFWS in compliance with the ESA. The Biological Opinion identified eight species that could be adversely impacted by APHIS ADC activities unless prescribed mitigation measures ("reasonable and prudent alternatives") were adopted by APHIS ADC. The potentially impacted species and the reasonable and prudent alternatives are discussed in detail in the Biological Opinion, and a summary is provided in Chapter 5. As Chapter 5 notes, APHIS ADC will adopt the reasonable and prudent alternatives to avoid adverse impacts to the eight species. The Biological Opinion is included in this EIS as Appendix F.

g. Summary of Biological Impacts

The previous sections discuss the present APHIS ADC program impacts on the abundance of target species. Analyses for 17 major target species are summarized in Table 4-31. National impact ratings were low for all of these species except the mountain lion, which was rated as moderate. Low or moderate ratings do not indicate nationally significant adverse impacts. Based on these evaluations, present APHIS ADC program activities have no nationally significant adverse impacts on the abundance of target or nontarget species. The APHIS ADC program also does not significantly impact the abundance of T&E species. The abundance of some target species is significantly, adversely impacted at the local level.

Because the analyses conclude that there are no national adverse impacts on the abundance of target or nontarget species, including T&E species, there also are no national impacts on diversity.

Table 4-31

Summary of National Impact Ratings for APHIS ADC Program Impacts on Selected Target Species[a]

Species	Magnitude[b,c]	Geographic Extent[b]	Duration and Frequency[b]	Likelihood[b]	National Impact Rating[b]	Significant Impact
Blackbird group	L	L	H	H	L	No
Starling	L	L	H	H	L	No
Cattle egret	L	L	H	H	L	No
Badger	L	M	H	H	L	No
Beaver	L	M	H	H	L	No
Black bear	L	L	H	H	L	No
Bobcat	L	L	H	H	L	No
Coyote	L	M	H	H	L	No
Gray fox	L	L	H	H	L	No
Red fox	L	L	H	H	L	No
Mountain lion	L	H	H	H	M	No
Nutria	L	L	H	H	L	No
Opossum	L	L	H	H	L	No
Porcupine	L	L	H	H	L	No
Prairie dog	L	L	H	H	L	No
Raccoon	L	M	H	H	L	No
Striped skunk	L	M	H	H	L	No

[a] The criteria used to determine NEPA significant impacts for use in this table are presented in Table 4-1.
[b] L = low; M = moderate; H = high.
[c] These determinations are based on the States that have the required data for a quantitative analysis or enough data to make a qualitative judgment.

3. Nonlethal Control Program Alternative

The Nonlethal Control Program Alternative is a modification of the Current Program Alternative wherein no lethal technical assistance or control would be provided by APHIS. Both technical assistance and direct control would be provided in the context of a modified IPM program; however, all methods used or recommended by APHIS ADC would be nonlethal in nature.

In cases where nonlethal methods are practical, they are presently being used. In these cases, the biological impacts will be the same as the biological impacts of the Current Program Alternative using similar methods (see p. 4-8).

Under this alternative APHIS ADC is limited to nonlethal methods; whereas other agencies, organizations, or individuals are free of restrictions to carry out necessary lethal control work to resolve wildlife damage. Since nonlethal controls alone do not always prevent or reduce wildlife damage or threats to public health and safety to acceptable levels, other government agencies, private organizations, and individuals would likely assume responsibility for implementing lethal controls necessary to adequately deal with these problems. Presumably, many service recipients would become frustrated with APHIS ADC's failure to resolve their wildlife damage, and would turn somewhere else for assistance; thus the biological impacts would be similar to the No Action Alternative. Actual examples of this has occurred where a land management agency placed more restrictions on APHIS ADC than those on the service recipients, so the service recipients implemented their own wildlife damage control using lethal methods. For more information regarding situations where nonlethal methods may or may not be practical, see Appendix J and Appendix N, Part II.

Significant variability in the level and scope of wildlife damage control activities could occur without a coordinated, national program, and this could have significant adverse impact on some local wildlife species including those listed as threatened or endangered. This particularly could result from the actions of individuals using lethal methods, including the misuse of chemicals, to resolve wildlife damage problems. Consequently, the potential for impacts on species diversity, target and nontarget species, and other wildlife under this alternative is expected to be greater than under the Current Program Alternative. While the biological impacts of this alternative would be the same as the Current Program Alternative when damage is controlled using nonlethal methods, the impacts would be similar to that described in the No Action Alternative when nonlethal techniques are not successful.

4. Nonlethal Before Lethal Control Program Alternative

The Nonlethal Before Lethal Control Program Alternative is a modification of the present APHIS ADC program that would require the use of all practical nonlethal methods prior to APHIS ADC recommending or using lethal controls to resolve wildlife damage problems. Ultimately, both nonlethal and lethal controls would be used under a modified IPM program. The impacts of this alternative on biological diversity would be similar to those described under the Current Program Alternative.

The process of using nonlethal methods before lethal methods tends to be counter intuitive to some service recipients. Often the service recipient needs the immediate problem solved while nonlethal methods are established as part of a long-term solution. In some cases, not only would lethal before nonlethal be more efficient, it could also increase the chance of the successful implementation of nonlethal techniques.

Since damage losses and the costs of implementing the Nonlethal Before Lethal Control Program Alternative generally fall on resource owners, many resource owners may believe that they can not afford the cost of this alternative and might act on their own using lethal methods. The actions of individuals attempting to resolve their own wildlife damage problems with lethal methods could have significant adverse impacts on some local wildlife species including those listed as threatened or endangered. This may occur in some situations in the period when APHIS ADC personnel are using nonlethal methods during the initial phase of control work. Impacts in these instances may be similar to those described under the No Action Alternative.

5. Damage Compensation Program Alternative

The Damage Compensation Program Alternative would direct all APHIS ADC program efforts and resources toward the verification and compensation of losses to agricultural resources resulting from vertebrate wildlife damage. For purposes of this EIS, it is assumed that the Damage Compensation Program Alternative would not compensate for nonagricultural losses, threats to public health and safety, aircraft strikes, or urban structural damage (see Chapter 2). A compensation program for production losses would not include direct control activities or research conducted by APHIS ADC personnel, nor would APHIS ADC technical assistance be available to encourage producers to use improved animal husbandry or other nonlethal damage control techniques.

An important premise of the Damage Compensation Program Alternative is that it would avoid the killing of wildlife by APHIS ADC personnel. Although this is true, the compensation alternative would also terminate technical assistance and other nonlethal aspects of the present APHIS ADC program. Additionally, it could result in very large expenditures for manpower and funding to validate compensation claims and administer payments. Compensation probably would not equal the full value of the losses incurred because of difficulties in making on-site confirmations and assessments. Not all producers or farmers would rely on a compensation program, and contrary to the premise that this alternative would avoid killing wildlife, other governmental agencies, groups, or individuals probably would conduct wildlife damage control, including lethal methods.

a. Compensation Program Levels

For the Damage Compensation Program Alternative, two compensation levels are considered: (1) full or parity compensation for the fair market value of the crop or livestock loss experienced by the individual producer or farmer, and (2) partial compensation or payment at a rate below the fair market value of the crop or livestock loss.

Compared with other alternatives, the parity compensation level would give the least incentive for the individual producer to limit losses through improved animal husbandry or crop management practices. However, from a practical perspective, it is doubtful that producers would sustain crop or livestock losses without attempting to conduct some loss prevention measures.

At the partial compensation level, the producer would be paid less than the market value of the loss. Therefore, the producer would be more likely to supplement partial compensation with the use of control methods. The partial compensation program would result in revenue losses to the producer, but not at the level that would occur in the absence of any compensation.

Verification of individual losses would require APHIS ADC personnel to conduct site visits. The timeliness of site visits would be important for accurate verification and would require a great deal of travel by APHIS ADC personnel in areas where high losses occur. Further complicating the verification issue would be the paperwork needed to process an individual claim. The handling of large numbers of claims by the APHIS

ADC State offices would require additions to the staff and significant increases in operating budgets to provide the manpower necessary to verify, coordinate, document, and disburse the compensation payments in a timely manner. Failure to provide verification of losses would result in fewer compensation payments, so producers would be more likely to implement their own damage control actions.

(1) Field Crops, Forests, Grazing Lands, and Other Agricultural Resources

Under the Damage Compensation Program Alternative the killing of depredating species by APHIS ADC personnel would cease. At parity compensation some producers might attempt to protect the resource despite damage compensation. At partial compensation producers would be more likely to offset wildlife damage by implementing measures to increase production, such as planting damage-resistant species, planting field crops when the depredating species is not in the area, planting decoy (lure) crops, or deep planting to avoid damage to sprouting crops. In addition, present APHIS ADC program control measures might be used, such as scare devices, exclusion devices, and other diversionary techniques to discourage crop damage. Some producers also might choose to implement whatever lethal means are available to control damage.

In general, implementing the Damage Compensation Program Alternative could lead to an increase in the abundance of certain species that damage field crops, forests, and other agricultural resources in areas where the present APHIS ADC program reduces local population levels.

Other depredating species populations could increase as well. As population levels of depredating species increase, damage also would be expected to increase.

At parity compensation locally significant, adverse impacts on the abundance and diversity of species responsible for damage to field crops, forests, and other agricultural resources could occur, because some producers would attempt to protect the resources despite damage compensation. At partial compensation levels such local impacts are more likely. If lethal controls are used by untrained individuals, there could be increased killing of wildlife, resulting in locally significant, adverse impacts on wildlife populations, including T&E species.

(2) Aquaculture and Mariculture

Marine and freshwater aquaculture is a relatively new and growing industry within the United States. The increase in aquacultural facilities has produced a new source of food for some fish predators, resulting in increases in species abundance and redistribution of populations. Wildlife damage has resulted and is increasing. Damage is attributable primarily to fish-eating bird species. An increasing concern is the potential for transmission of fish disease by birds. Under the Damage Compensation Program Alternative damage to aquacultural resources could be expected to increase as the industry grows and the populations of depredating species increase or alter their migratory behavior to capitalize on concentrations of fish or shellfish. At parity compensation the producer might attempt to protect the resource despite damage compensation. The abundance of depredating species could be impacted. At partial compensation producers would be more likely to implement damage controls in an effort to limit their losses. As the case would be with field crops, forests, and other agricultural resources, the use of lethal controls by untrained individuals could lead to indiscriminate killing of wildlife. For example, scavenging species such as black vultures, though not responsible for depredation, may feed on fish that died of natural causes or were killed by other depredating species. Untrained individuals may blame these scavengers and kill them. Situations like this could have significant adverse impacts on the abundance and diversity of wildlife species, particularly T&E species.

(3) Livestock

Farmers and ranchers view the production of livestock differently than the production of crops. Even at parity compensation, livestock producers are less likely than crop producers to rely solely on a compensation program and would be more likely to use various damage control methods. This could be especially true for producers who selectively breed their stock to develop superior characteristics. Populations of depredating wildlife species probably would continue to be subject to control. Locally significant, adverse impacts on the abundance and diversity of depredating species could occur. At partial compensation levels, producers would be more likely to implement damage control measures, resulting in greater impacts on the abundance and diversity of wildlife.

Under the Damage Compensation Program Alternative, as with the other proposed alternatives, the use of various damage control methods by untrained individuals for the protection of livestock could adversely affect wildlife. The frequency of chemical misuse could increase, causing significant adverse impacts on various wildlife species.

(4) Facilities and Structures, Public Health and Safety, and Wildlife

Under the Damage Compensation Program Alternative the protection of all resources that are included in the categories of facilities and structures, public health and safety, and wildlife (see Chapter 3) would be the responsibility of the affected agency or owner. No compensation would be paid for wildlife damage to these nonagricultural resources.

If the affected agencies or owners do not choose to implement damage controls, no adverse impacts on the abundance or diversity of species responsible for damage would be expected. Rather, the abundance of the species responsible for the damage and spread of disease could increase.

It is unlikely that the affected agencies or owners would not take action to control damage to their property or resources. It is more likely that whatever means are available would be used to control the damage. As in the case of agricultural resources, the implementation of damage controls by untrained individuals to protect nonagricultural resources could lead to adverse impacts on wildlife. Adverse impacts also could occur, even if trained personnel were implementing the controls, because of a lack of coordination among persons applying the controls. Without the APHIS ADC program to provide a balance between demand for wildlife damage control and the wildlife resources, less discriminate application of control could lead to more killing. This could result in collectively excessive application of controls. The adverse impacts on wildlife from the untrained use or overuse of controls could be significant, particularly for T&E species.

b. Summary of Biological Impacts

Biological impacts that would occur under the Damage Compensation Program Alternative would be similar to those that occur under the Current Program Alternative. An important distinction is that, under the Damage Compensation Program Alternative, all APHIS efforts would be directed toward verification and compensation for agricultural damage. APHIS personnel would no longer conduct control activities, so the biological impacts attributable to APHIS ADC control actions of the Current Program Alternative would not occur. However, other Federal, State, or local agencies as well as individuals could conduct control actions much like those currently conducted or supervised by APHIS ADC. Such actions probably would produce impacts similar to those of the Current Program Alternative. In addition, misuse of chemicals and other methods could increase and adversely impact certain wildlife populations and public health and safety.

D. Economic Impact Assessment

1. Introduction

In addition to the biological, sociocultural, and physical impacts addressed in other sections of this chapter, decisionmakers must also consider the potential economic impacts of the proposed action and its alternatives. CEQ regulations do not require a formal benefit-cost analysis, but they do require that considerations important to a decision among alternatives be identified and analyzed so that the merits and drawbacks of the alternatives can be compared. This section describes, analyzes, and compares the potential economic impacts of the five program alternatives. To the extent possible, benefit-cost analyses of program activities are quantified when reliable data exist.

This assessment of the economic impacts of the proposed APHIS ADC program alternatives is divided into three parts:

- A discussion of benefits of the Current Program Alternative, including the approach taken to estimate benefits given data availability, and examples of benefits from selected APHIS ADC program activities.
- A comparison of the program alternatives by illustrating their relative cost effectiveness for nine wildlife damage scenarios.
- A discussion of the direct and indirect impacts of the alternatives.

2. Current Program Benefits

a. Approach

The total economic impact of wildlife damage control to individuals sustaining damage, society at large, and government entities is comprised of direct and indirect effects. These effects result from the reduction or avoidance of financial losses attributable to wildlife damage and the impacts associated with implementing damage control methods. The purpose of this section is to systematically identify the economic impacts of representative activities of the Current Program Alternative and the relative worth to society of the benefits and costs that are thus revealed.

Economic impacts of the APHIS ADC program are principally benefits resulting from actions taken to avoid losses, that is, the difference between the value of losses realized when no APHIS ADC activities are initiated and when APHIS ADC is involved. These avoided losses are the focus of this section. For a complete economic analysis, indirect costs such as unintentional harm to nontarget wildlife and other environmental impacts would need to be considered. Indirect benefits to neighboring ranches or to nontarget wildlife would also have to be taken into account. However, such a comprehensive accounting of benefit and cost components and tradeoffs are beyond the objective of this section, namely, of presenting examples of avoided losses attributable to the APHIS ADC program. The major example described is the effects of coyote damage control on sheep losses. This is followed by shorter examples of other agricultural losses avoided due to wildlife damage control.

b. Analytical Limitations

As discussed in Chapter 3, reliable estimates of current wildlife-caused losses for agriculture are difficult to obtain because of the lack of techniques and resources to verify such losses. Chapter 3 attempts to address the magnitude of selected losses by depicting ranges gathered from survey loss estimates available in the literature and confirmed loss values compiled by APHIS ADC program personnel. Estimates obtained from the literature, however, cannot be considered as losses that are incurred entirely under the Current Program Alternative because APHIS ADC provides damage control assistance for only a

portion of crops and livestock affected by wildlife. The confirmed loss data, on the other hand, represent only a small portion of the total reported losses occurring under the Current Program Alternative since they are collected primarily to substantiate the occurrence of wildlife damage and the need for assistance for affected resources.

Perhaps the most striking fact with regard to losses from wildlife damage is that although average losses to wildlife are small as compared to overall losses from other causes, the damages are not evenly distributed over time or area. A small proportion of producers absorb high losses, whereas the vast majority of producers sustain less serious economic damage. Thus, even if accurate loss estimates were obtainable, the use of a single average statistic to infer overall program effectiveness would not accurately reflect the distributional variations.

An inherent problem in assessing avoided losses is the lack of an adequate control group as a point of reference to compare observed loss rates. This is complicated by the fact that only a few localized studies have been conducted that are designed specifically to observe the effects of control efforts on resource losses and wildlife populations. To add to the measurement difficulty, the effectiveness of the APHIS ADC program lies in combining methods of control.

Inherent difficulties also exist in the valuation of wildlife. The most accepted system for valuing wildlife is based on broad categories of wildlife "use": exercised values, option values, and existence values (Bishop 1987). "Exercised values" reflect involvement with wildlife, either as a direct consumer (such as a hunter) or in more indirect, nonconsumptive activities (such as going to zoos or viewing photos). "Option values" encompass the willingness to pay for opportunities to use wildlife in the future. For example, the willingness to contribute to wildlife preservation programs today is, presumably, related to the possibility of enhanced personal enjoyment of wildlife in the future. "Existence values" include the values that nonusers place on wildlife, whether it be for their lifetime or after.

Estimates of the exercised values of wildlife measured in terms of expenditures spent on recreation abound in the literature (Steinhoff et al. 1987, USDI 1988). Although not found as frequently, the other types of wildlife values also have been examined. However, these estimates are not directly applicable to this analysis. As species, the animals have positive value for society, but the specific individuals that cause economic losses have negative value for producers and others sustaining damage. Moreover, assigning a specific value to wildlife that are affected within the scope of a national program such as APHIS ADC would be analytically intractable.

Notwithstanding these measurement difficulties, calculations of avoided losses (or benefits) from wildlife damage control are empirically estimated for controlling predation on sheep, specifically, coyote predation. Benefits are limited to savings to producers in terms of physical losses avoided from implementing wildlife damage control. The consequent price changes and effects on producer income and consumer welfare are considered. However, no attempt is made to quantitatively account for intangible impacts resulting from specific damage control methods.

The set of brief agricultural and nonagricultural examples illustrates for other types of producers and individuals the losses incurred with and without controls in place. For the example of birdstrikes at airports, the objective of wildlife damage control efforts is first and foremost improved safety. The value of reduced risk of injury is difficult to quantify. Nevertheless, the benefit of damage control is clearly indicated by the decrease in collisions following implementation of control activities.

The diversity of APHIS ADC program activities precludes a program-wide evaluation of alternatives by the standard benefit-cost framework. However, the following descriptions and estimations demonstrate the worth of principal aspects of the APHIS ADC program.

c. Valuing Avoided Losses

(1) Coyote Damage Control

The APHIS ADC program in predator damage control is a Federal cooperative program providing services to other Federal, State, and private organizations and individuals in support of programs to lessen predator damage. The primary recipients of program assistance for predator control are sheep producers. The majority of sheep protected under the program are those in 16 western and mountain States where the sheep population comprises 75 percent of the total sheep population in the United States.

An assessment of the economic impact of APHIS ADC's current program activity in coyote damage control requires that the benefits accruing from the program be compared with the costs incurred by the Agency to achieve those benefits. Benefits or avoided losses are defined as the difference between the value of producer losses expected when no program action is initiated and the damages expected when current program activities are implemented. These avoided losses are restricted to reductions in producer income due to livestock losses and the resulting price increase and its impact on consumer welfare. Benefits from the current program are realized through a combination of control measures involving lethal and nonlethal means.

In the assessment of program costs, the comparison is based only on costs associated with APHIS ADC and State and other cooperator expenditures in the Current Program Alternative for coyote predation on sheep. The analysis is focused on APHIS ADC activities in the mountain and western States where coyote predation is most prevalent.

Guard dogs may prevent or reduce damage by predators such as the coyote.

(a) Estimating Current Losses With Damage Control

Despite a great deal of information on the causes and magnitude of sheep losses to predators available in the literature, the extent to which loss patterns can be inferred remains limited. Estimates of sheep losses to coyotes vary considerably depending on the regions studied, approaches used, and years reported. Loss information has been obtained from field studies, personal interviews, and mailed questionnaires. None of these methods provides a direct count of the total number of animals that die in a year or the causes of death. Although some degree of bias exists in all of these methods, there is enough consistency among the surveys to approximate the range and order of magnitude of the actual loss values.

One of the most recent and extensive surveys of ranchers on sheep and goat losses to predators was completed by the USDA National Agricultural Statistics Service (NASS). The survey data included information on total losses from about 57,300 agricultural producers plus additional information from operators of about 7,500 small land area tracts (USDA 1991a). This data set is selected as the basis for the loss analysis since it provides the most recent tally of predator damage nationwide, thereby allowing for comparisons with past regional studies.

Table 4-32 shows a breakdown of the NASS estimated losses of sheep and lambs in 1990. Roughly 549,000 lamb deaths occurred from all causes of nearly 6 million lambs born in the 16 western States in that year. This loss represented about 10 percent of all lambs born. Of the total lamb deaths, nearly 60 percent were attributable to predators. Approximately 70 percent of predator damages in these States were due to coyotes.

A recent APHIS ADC survey indicated that in 1990, the owners of nearly 56 percent of sheep and 70 percent of lambs in the 16 States were provided APHIS ADC assistance, largely in the form of direct control (Table 4-33). Because the APHIS ADC program currently provides damage control assistance for only a portion of sheep and lambs affected by coyotes, the NASS loss statistics are correspondingly adjusted to reflect only losses occurring under the program. Therefore, as a percentage of the quantity of sheep and lamb population protected by APHIS ADC, the adjusted losses of 42,000 sheep and 148,000 lambs shown in Table 4-34 represent an average loss rate of 1.2 percent and 4 percent for sheep and lambs, respectively, in the region. These rates fall within the normal range of losses with control reported in the literature of between 1 percent to 2.5 percent for sheep and 4 percent to 8 percent for lambs (USDI 1978).

The physical losses of sheep and lambs to coyotes in turn impact producers and consumers through increases in price. Table 4-35 shows that while some producers encounter losses, others benefit from predation. The decrease in receipts because of coyote predation on sheep and lambs is estimated at $10.1 million based on the loss rate of 1.2 percent for sheep and 4 percent for lambs, and an average market value of $76 per sheep and $32 per lamb in 1990. In contrast, producers who had no losses to coyotes in 1990 likely had a $691,000 increase in sales because of slightly higher prices. The resulting impact to the industry as a whole is estimated to be $9.4 million in reduced sales.

Various examples in this EIS use different market values for sheep and lambs. This difference is a result of regional factors, time of year, or quality of breed influencing the value.

The impact of coyote predation on consumers is the result of reduced supplies and correspondingly higher prices of meat. In 1990, consumer welfare was roughly $2 million less than it would have been with no coyote predation. This estimate, however, does not take into account the availability of foreign imports to meet domestic market demand.

The economic impacts on producers and consumers can be added together to provide an indication of the total gross cost of coyote predation. In 1990, this total gross cost was approximately $11.4 million. This estimate does not include private control expenditures or other indirect impacts on other economic activities and local economies.

Table 4-32

Losses of Sheep and Lambs by All Causes, by Predators, and by Coyotes, 16 Western States, 1990

	Sheep Inventory [a]				*Lamb Crop* [b]			
State	Number	Losses by all causes	Losses by Predators	Losses by Coyotes	Number	Losses by all causes	Losses by Predators	Losses by Coyotes
AZ	220,000	8,000	4,000	2,600	115,000	11,000	7,500	5,100
CA	775,000	32,000	9,900	5,300	535,000	30,000	17,700	12,800
CO	455,000	25,000	9,000	5,900	425,000	16,000	30,500	26,300
ID	270,000	13,000	3,600	2,600	255,000	50,000	7,600	6,200
MT	640,000	40,000	7,600	6,100	535,000	40,000	23,000	19,100
NE	135,000	11,000	1,700	1,500	120,000	21,000	4,600	4,200
NV	97,000	9,000	4,500	3,200	80,000	15,000	9,200	6,300
NM	473,000	35,000	10,000	4,300	260,000	35,000	27,000	10,600
ND	152,000	9,000	1,700	1,100	171,000	21,000	5,300	4,500
OK	105,000	5,000	3,000	2,800	85,000	10,000	4,900	4,400
OR	345,000	19,000	5,100	3,200	320,000	39,000	18,800	9,900
SD	535,000	30,000	8,700	8,200	540,000	55,000	22,700	20,700
TX	1,890,000	92,000	27,000	16,000	1,150,000	120,000	80,000	40,000
UT	485,000	25,000	9,300	6,500	430,000	34,000	22,100	15,000
WA	83,000	3,000	400	200	70,000	7,000	1,400	1,100
WY	705,000	29,000	5,700	4,300	550,000	45,000	26,600	21,900
Subtotal	7,365,000	385,000	111,200	73,800	5,641,000	549,000	308,900	208,100
Other States	2,236,300	133,500	31,000	10,700	2,063,000	260,900	38,400	19,300
Total U.S.	9,601,300	518,500	142,200	84,500	7,704,000	809,900	347,300	227,400

[a] "Sheep" are the total of stock sheep and lambs on January 1, 1990.

[b] "Lamb crop" is defined as lambs docked or branded in 1990.

Sources: USDA 1991a, and USDA 1991b.

Table 4-33

Sheep Inventory, Lamb Crop, and Numbers Protected Under Current Program Activities, 1990

	Sheep inventory [a]			Lamb crop [b]		
State	Number	Protected by APHIS ADC [c]	Percent of Inventory Protected	Number	Protected by APHIS ADC [c]	Percent of Crop Protected
AZ	220,000	60,719	28	115,000	84,057	73
CA	775,000	361,358	47	535,000	466,133	87
CO	455,000	409,500	90	425,000	383,000	90
ID	270,000	249,750	93	255,000	235,875	93
MT	640,000	344,425	54	535,000	350,000	65
NE	135,000	54,000	40	120,000	48,000	40
NV	97,000	97,000	100	80,000	80,000	100
NM	473,000	268,550	57	260,000	204,913	79
ND	152,000	129,000	85	171,000	161,125	94
OK	105,000	27,959	27	85,000	30,505	36
OR	345,000	275,000	80	320,000	250,000	78
SD	535,000	240,750	45	540,000	270,000	50
TX	1,890,000	756,961	40	1,150,000	634,120	55
UT	485,000	320,387	66	430,000	289,765	67
WA	83,000	20,750	25	70,000	17,500	25
WY	705,000	500,000	71	550,000	462,000	84
Total	7,365,000	4,116,109	56 [d]	5,641,000	3,966,993	70 [d]

[a] "Sheep" are the total of stock sheep and lambs on January 1, 1990 (USDA 1991b).

[b] "Lamb crop" is defined as lambs docked or branded in 1990.

[c] Sheep and lambs protected are defined as the number of sheep and lambs found on properties and allotments where direct control assistance was provided by the program.

[d] Weighted average.

Table 4-34

Losses of Sheep and Lambs With and Without Coyote Damage Control, 1990

State	Sheep: Losses with control [a]	Sheep: Losses without control [b]	Sheep: Difference between losses with and without control	Lamb Crop: Losses with control [a]	Lamb Crop: Losses without control [b]	Lamb Crop: Difference between losses with and without control
AZ	718	2,732	2,014	3,728	14,290	10,562
CA	2,471	16,261	13,790	11,152	79,243	68,091
CO	5,310	18,428	13,118	23,701	65,110	41,409
ID	2,405	11,239	8,834	5,735	40,099	34,364
MT	3,283	15,499	12,216	12,495	59,500	47,005
NE	600	2,430	1,830	1,680	8,160	6,480
NV	3,200	4,365	1,165	6,300	13,600	7,300
NM	2,441	12,085	9,644	8,354	34,835	26,481
ND	934	5,805	4,871	4,240	27,391	23,151
OK	746	1,258	512	1,579	5,186	3,607
OR	2,551	12,375	9,824	7,734	42,500	34,766
SD	3,690	10,834	7,144	10,350	45,900	35,550
TX	6,408	34,063	27,655	22,056	107,800	85,744
UT	4,294	14,417	10,123	10,108	49,260	39,152
WA	50	934	884	275	2,975	2,700
WY	3,050	22,500	19,450	18,396	78,540	60,144
Total	42,151	185,225	143,074	147,883	674,389	526,506

[a] Losses with control are NASS loss statistics (Table 4-32 - "Losses by Coyotes") adjusted to reflect the differentiation between losses occurring in the fraction of the sheep and lamb population that are afforded APHIS ADC program protection and those that do not receive APHIS ADC protection.

[b] Losses without control are based on survey estimates of 4.5 percent rate of loss for sheep and 17 percent for lamb crops, and the application of these rates to the numbers of sheep and lamb crop protected (Table 4-33).

Table 4-35

Economic Impact of Coyote Predation in 16 Western States, 1990

	Sheep production			Value of production			Lamb production			Value of production		
Producer group	Actual [a]	With no losses to coyotes [b]	Impact of coyotes [c]	Actual (@ $76)	With no losses to coyotes [d] (@ $75.86)	Impact of coyotes	Actual [a]	With no losses to coyotes [b]	Impact of coyotes [c]	Actual (@ $32)	With no losses to coyotes [d] (@ $31.78)	Impact of coyotes
		(1,000 head)			($ 1,000)			(1,000 head)			($ 1,000)	
Western producers (16 States)	6,980.1	7,053.9	(73.8)	530,487.6	535,108.9	(4,621.3)	5,092.0	5,300.1	(208.1)	162,944.0	168,437.2	(5,493.2)
Other States	2,102.8	2,102.8	0.0	159,812.8	159,518.4	294.4	1,802.1	1,802.1	0.0	57,667.2	57,270.7	396.5
Total U.S. Producer Losses	9,082.9	9,156.7	(73.8)	690,300.4	694,627.3	(4,326.9)	6,894.1	7.102.2	(208.1)	220,611.2	225,707.9	(5,096.7)
Consumer Losses [e]						(982.4)						(1,143.1)
Total Losses						(5,309.3)						(6,239.8)

[a] The number of sheep and lambs marketed is calculated by subtracting losses from all causes from the 1990 sheep and lamb crop inventory (Table 4-32).

[b] The quantity of sheep and lambs that would have been marketed if no coyote predation exists is estimated by subtracting non-coyote losses from the 1990 sheep and lamb crop inventory (Table 4-32).

[c] These estimates do not take into account sheep and lambs that would have been lost to other causes if not to coyotes.

[d] The projected sheep and lamb prices are based on average prices per head of $76 for sheep and $32 for lambs in the 16 States, and a price flexibility (which measures the responsiveness of prices to quantity changes) of -0.17 for sheep and lambs (USDI 1978).

[e] Consumer losses, measured in terms of consumer surplus, are based on the assumption of fixed supply functions for sheep and lambs.

(b) Estimating Losses Without Damage Control

The above analysis provides an indication of the magnitude of forgone sheep and lamb sales from prevailing levels of coyote predation with the present program in effect. The value of the Current Program Alternative can be measured by assessing the losses that are avoided under the present program. The calculation of benefits of coyote damage control under this alternative hinges upon only 5 years of data from four studies of sheep herds with no predator control. Table 4-36 is a summary of the available sheep loss studies with both public and private predator damage control withheld. Each study involved intensive field verification of dead or injured sheep. The Henne (1975) and Munoz (1977) studies, and Delorenzo and Howard (1976) provided two complete years of study in Montana and New Mexico, respectively, whereas the McAdoo and Klebenow (1978) study was conducted one summer in California. The unweighted average rate of loss to coyote was 4.5 percent for sheep and 17 percent for lambs.

Recognizing that these rates may not be completely applicable but lacking better information for empirical purposes, these estimates serve as the basis for our avoided loss estimate. If these loss rates were applied to the inventory of sheep and lambs protected, the resulting hypothetical loss with no coyote damage control would have amounted to 185,000 sheep and 674,000 lambs that would have been lost in the 16 western States.

As mentioned above, the NASS survey of losses with control in effect, at 1.2 percent for sheep and 4.0 percent for lambs, yielded about 42,000 and 148,000 head lost, respectively. The true estimate of the losses to be expected in the absence of control is calculated as the difference between, in the case of sheep, the 4.5 percent rate of loss in the absence of control and the actual losses at the current level of 1.2 percent rate. Subtracting loss rates for lambs in a corresponding manner yields about 670,000 additional sheep and lambs that would have been lost if control were withheld (Table 4-34).

The above physical loss with coyote predation, after adjusting for price impacts, represents a potential decrease in annual receipts to producers of nearly $24 million if control activities were withdrawn. Sheep producers without predation losses would benefit from the higher prices caused by the coyote predation suffered by affected producers. The estimated gain to these producers would be about $1.6 million in gross sales (Table 4-37). Therefore, the net impact to producers as a whole in the absence of control is estimated at approximately $21.8 million in annual losses.

Table 4-36

Summary of Field Studies of Sheep Loss Without Coyote Control

			Annual Losses (%)	
Source	**Location**	**Years**	**Sheep**	**Lambs**
1. Henne (1975)	Montana	1974	7.5	28.8
2. Munoz (1977)	Montana	1975	8.1	24.2
3. McAdoo and Klebenow (1978)	California	1976	1.4	6.2
4. Delorenzo and Howard (1976)	New Mexico	1974	0	12.1
do.	New Mexico	1975	0.9	12.1

Table 4-37

Economic Impact of No Coyote Damage Control in 16 Western States, 1990

Producer Group	Sheep Production			Value of Production			Lamb production			Value of production		
	With No Control [a]	Actual [b]	Impact of No Control	With No Control [c] (@ $76.26)	Actual (@ $76)	Impact of No Control	With No Control [a]	Actual [b]	Impact of No Control	With No Control [c] $32.56)	Actual (@ $32)	Impact of No Control
		(1,000 head)			($1,000)			(1,000 head)			($1,000)	
Western Producers (16 States)	6,837.0	6,980.1	(143.1)	521,389.6	530,487.6	(9,098.0)	4,565.5	5,092.0	(526.5)	148,652.7	162,944.0	(14,291.3)
Other States	2,102.8	2,102.8	0.0	160,359.5	159,812.8	546.7	1,802.1	1,802.1	0.0	58,676.4	57,667.2	1,009.2
Total U.S. Producer Losses	8,939.8	9,082.9	(143.1)	681,749.1	690,300.4	(8,551.3)	6,367.6	6,894.1	(526.5)	207,329.1	220,611.2	(13,282.1)
Consumer Losses [d]						(1,796.2)						(2,704.1)
Total Losses						(10,347.5)						(15,986.2)

[a] These estimates are derived as follows: 1990 inventory of sheep and lamb crop minus non-coyote caused losses minus losses of sheep and lambs not protected by APHIS ADC program minus losses without control (Tables 4-32, 33, and 34).

[b] The number of sheep and lambs marketed is calculated by subtracting losses from all causes from the 1990 sheep and lamb crop inventory (Table 4-32).

[c] The projected sheep and lamb prices are based on average prices per head of $76 for sheep and $32 for lambs in the 16 States, a coyote predation rate without control of 4.5 percent for sheep and 17.0 percent for lambs, and a price flexibility (which measures the responsiveness of prices to quantity changes) of -0.17 for sheep and lambs (USDI 1978).

[d] Consumer losses, measured in terms of consumer surplus, are based on the assumption of fixed supply functions for sheep and lambs.

Consumers would be negatively impacted by the reduction in supplies and higher prices of sheep and lambs. Based on 1990 average per animal prices, consumers would lose almost $4.5 million if control activities were to cease. Thus, the overall total impact of no control compared to the current control level is estimated to be nearly $26.3 million per year. Although these are rough estimates, these loss figures do indicate that the greatest impact of the withdrawal of coyote damage control would be on producers rather than consumers.

It should be noted that in actuality even if APHIS ADC's control activities were to cease, the loss rates without control presented above would never be reached. Such high losses are unlikely to be sustainable by ranchers. If predation losses rose, private control efforts would increase. Those who could not afford the increased cost of predation or predation control would withdraw from the business. Individual States would also likely expand their wildlife damage control assistance. The estimates serve as the upper limit on the possible range of losses if control activities were withdrawn.

(c) Comparison of Benefits and Costs

The efficiency of coyote damage control activities of the Current Program Alternative can be obtained by comparing the benefits calculated above with the costs incurred to achieve that level of benefits. An estimate of the APHIS ADC (Federal and cooperative) funds allocated to the protection of sheep and lambs from predation in the 16 western States is presented in Table 4-38. Over $11 million, or 63 percent, of the total funds expended on livestock protection in 1990 is dedicated to sheep and lambs.

From the program cost data, and using an avoided loss or benefit estimate of $26.3 million that includes only the value of lost sheep and lambs, a benefit-cost ratio of 2.4:1 is obtained. This ratio indicates the returns that can be expected for each dollar spent in the cooperative predator damage control program for sheep.

The conclusion deduced from the above benefit-cost estimate requires qualification because of the exclusion of certain impacts. Some of the omissions noted earlier, such as private control costs, would have likely increased the benefits of the Current Program Alternative. Benefits are also understated by the exclusion of intangible impacts that are difficult to quantify. The additional benefits of predator damage control such as protection of wildlife populations and increases in nontarget carnivore populations are difficult to evaluate in monetary terms for inclusion in a societal benefit value (Connolly 1981). Predator control incurs additional costs in that the coyotes have a fur value that may not be realized if not marketed, as well as aesthetic worth to some members of the public. Nontarget wildlife species may also be indirectly affected by specific control methods at an additional cost to society.

(d) Conclusions

The economic feasibility of the Current Program Alternative in coyote damage control is achieved through the application of both lethal and nonlethal methods, depending upon individual circumstances. Although the benefit-cost ratio indicates the feasibility of the Current Program Alternative as a national program, it does not reveal the varying effects that coyote predation and its control have on individual producers.

The sheep industry has been operating on a low profit margin because of a combination of factors; predation, labor shortage, and low commodity prices are among those commonly cited (Wagner 1988). The decline of the sheep industry may have occurred even without coyote predation. For ranchers who are already operating on a small profit margin, the addition of a few percent loss could drive a business into deficit. Given the uneven nature of the distribution of wildlife damages experienced among ranchers, the APHIS ADC program operates on a request-for-service basis, providing case-specific assistance. It may be argued that private efforts should assume a greater share of the responsibility for con-

Table 4-38

Disposition of APHIS ADC Federally Appropriated and Cooperative Funds for Livestock Protection, 16 Western States, FY 1990 (in dollars)

	Livestock						
State	Sheep and Lambs	Goats	Cattle and Calves	Turkeys	Hogs and Pigs	Other	Total State
AZ	181,834	16,044	336,927				534,805
CA	1,279,411	118,464	284,313	47,385	23,693	616,013	2,369,279
CO	891,047		27,990		9,330	4,665	933,032
ID	542,735		343,732			18,091	904,558
MT	967,542		241,886				1,209,428
NE	91,928	1,915	91,928	3,830	1,915		191,516
NV	948,349		129,320				1,077,669
NM	803,463	60,638	636,706	3,789	3,789	7,578	1,515,963
ND	183,512	8,156	187,589	16,312	4,078	8,156	407,803
OK	155,735	94,553	211,354	11,124	11,124	72,306	556,196
OR	499,454		390,482	4,540	4,540	9,081	908,097
SD	169,397		72,599				241,996
TX	1,617,254	1,257,864	431,268			287,512	3,593,898
UT	1,387,706		29,215	43,822			1,460,743
WA	100,485	2,871	183,744				287,100
WY	1,233,984		154,248		7,011	7,011	1,402,254
Total	11,053,836	1,560,505	3,753,301	130,802	65,480	1,030,413	17,594,337

trolling coyote predation. However, APHIS ADC program presence may have broader, less apparent benefits, such as avoiding inappropriate wildlife control measures which might be chosen by independent individuals.

(2) Other Damage Control Examples

As shown, the avoided losses attributable to coyote damage control activities are a major accomplishment of the APHIS ADC program. The following summaries of examples taken from the literature describe other valuations of avoided losses that have been estimated for various private and public enterprises.

Corn Losses to Birds. Among animal damage control studies conducted by researchers at APHIS ADCs Denver Wildlife Research Center, is one that examined the control of bird damage to ripening corn fields in Brown County, SD (Besser and DeGrazio 1985). An 87 percent reduction in grain losses compared to pretreatment levels was reported. Avitrol baits were spread along corn rows over a 2-week period. (One hundred of the 190 acres studied were also treated with an insecticide in order to control the disappearance of grain baits.) During a 3-day pretreatment period, approximately 142 bushels of corn were

lost to birds each day, or about 0.75 bushels per acre. Only about 0.1 bushels per acre were lost each day during the 14-day baiting period, thereby saving an average of 0.65 bushels per acre per day.

Valuing the corn at $2.78 per bushel, the benefits of baiting for the 2-week period were calculated to total about $4,800 for the 190 acres, and baiting costs (exclusive of labor) were about $870. About 10 person-hours were required to bait the fields and to install baiting lines. Therefore, a net benefit, not including labor, of about $3,930 implies $393 worth of corn was saved for each hour spent baiting and creating bait lines.

Timber Losses to Beavers. As reported by Lowney (1989), a 6-month cooperative beaver damage control project between the Mississippi Band of Choctaw Indians and the APHIS ADC Program resulted in the successful reclamation of 993 inundated acres. A total of 169 beavers and 50 dams were removed from 6 watersheds within the 12,000-acre Pearl River Community to reclaim the land for timber production, firewood, and recreation.

The direct control activities for the project cost a total of $10,966, of which one-half was paid by the Choctaw Indians. The timber, valued at $198,600 ($200 per acre), would have been lost if the inundated land had not been drained of impounded water. Thus, the project yielded a net savings to the Choctaw Indians of more than $193,000.

Public Road and Private Land Losses to Beavers. In Horry County, SC, Hudson (1993) reports major savings to public roads and structures and private farmland and timberland as a result of a beaver damage control program. The savings to the county government in terms of equipment costs and labor that would have been expended on road and structural repairs were estimated to total more than $218,000. Although public works were the focus of the program, a side benefit was private land brought back into production. Potential incomes from recovered farmland (197 acres) and timberland (1,614 acres) that had been inundated were estimated at more than $42,000 and $800,000, respectively. Earnings from the farmland represent the market value of one year of crop production. The income for the timberland is based on a minimum value of standing trees ($500 per acre).

The cost of this cooperative program between Horry County and APHIS ADC during its first year of operation, FY 1993, was approximately $30,000, including equipment and salary costs. Thus, the net savings, public and private, of the project totaled over $1,030,000. With the planned expansion of the county road system, damage by beavers can be expected to be an ongoing problem, making an effective control program of continuing importance.

Sheep Losses to Coyotes. In a 1980-81 study of the efficacy of denning, Till and Knowlton (1983) reported a decrease of over 90 percent in the number of sheep killed when coyote adults and pups, and pups only, were removed from study areas on the open range in south-central Wyoming. When both adults and pups were removed, predation incidents declined 98 percent, and the number of sheep killed was reduced by 99 percent. When only the pups were removed, recorded predation incidents decreased 88 percent, and the number of sheep killed decreased by 92 percent.

Assuming a 5-year (1977-81) average market value of $57.74 per cwt (hundredweight) for lambs and total expenses incurred for den hunting of $1,670 per month, the authors estimated that it would be necessary to save 3.62 lambs to recover costs (on a per den basis), or about 5.1 days of den hunting to break even.

Sheep Losses to Coyotes. The result of field trials on the use of electronic frightening devices for reducing coyote predation on sheep during 1982 through 1987 was reported by Linhart et al (1992). On 15 high mountain summer ranges, the devices reduced sheep losses on average about 60 percent with a mean dollar savings of lambs of over $2,400 per sheep band. The use of this nonlethal device did not appear to result in higher levels

of predation on adjacent bands of sheep. The manufacture and sale of the device for $225 each under the name "Electronic Guard" was begun in 1991 by APHIS ADC Program Pocatello Supply Depot.

Sheep Losses to Coyotes. In April 1990, the Virginia Department of Agriculture and Consumer Services and APHIS ADC entered into a cooperative service agreement to provide livestock producers necessary technical and operational assistance in identifying, controlling, and abating coyote damage to agricultural animals (Tomsa n.d.). APHIS ADC personnel provided technical assistance on predator-resistant electric fencing, the use of guard dogs, and other methods of nonlethal control. Direct control measures by APHIS ADC consisted primarily of lethal methods.

Twenty-nine of the sheep production operations evaluated by APHIS ADC personnel experienced losses on more than one occasion prior to APHIS ADC recommendations or operations. These producers lost an average of 21.3 sheep over an average period of 2.6 months prior to APHIS ADC involvement, or one sheep every 3.7 days. The same producers lost an average of 2.9 sheep over an average period of 8.9 months subsequent to APHIS ADC involvement, for an average rate of one sheep every 93.4 days. Loss records for FY 1990 and FY 1991 show that 90 percent of all sheep losses occurred during January, March-June, August, and December. If these producers, without APHIS ADC assistance, had lost sheep at the rate of one head per 3.7 days for these 7 months, a combined annual loss of 1,682 sheep would have resulted. Combined losses over the 7-month period at the average loss rate with APHIS ADC assistance of one head every 93.4 days would be about 67 sheep. Forgone losses equal 1,615 sheep.

Assuming an average value of $60 per sheep, the savings amounted to nearly $96,900. The total annual program budget was $60,000. The positive net benefit was an encouraging signal that the program was worth expanding beyond the pilot stage.

Sheep Losses to Coyotes. In surveys of Colorado sheep producers with and without livestock guarding dogs, Andelt (1992) determined that producers that used guarding dogs in 1986 generally lost a smaller proportion of their ewes and lambs to all causes and to coyotes than did producers without guarding dogs. Estimate of sheep mortalities for producers without guarding dogs was obtained from a general postal survey mailed to 433 producers, while another survey was mailed to 30 sheep producers that used or were suspected of using livestock guarding dogs. Eleven of the producers that used dogs estimated that each of their dogs saved an average of $3,216 of sheep annually. Guarding dogs were considered a cost-effective method of reducing sheep mortality for the majority of producers employing them when the average annual savings were compared with the first-year average expenses of $883 (which included purchase cost, shipping, feed, veterinary expenses) and subsequent yearly expenses averaging $286 for food, veterinary care, and miscellaneous expenses.

Reducing Bird-Aircraft Collision Risks. An important mission of the APHIS ADC program is helping to reduce wildlife threats to public health and safety. An example of APHIS ADC operations in this area are activities undertaken to control the serious problem of bird-aircraft collisions at John F. Kennedy International Airport (JFKIA), New York City.

The collision of birds with aircraft poses serious threats to human safety for air passengers and other people residing in the vicinity of JFKIA. Between 1988 and 1990, there were an average of 170 bird-aircraft collisions annually. The select list of incidents presented in Table 4-39 and the many others that occurred at JFKIA have resulted in damaged and destroyed engines and other aircraft parts, runway closures, and delays. The risk to passenger safety is immeasurable. In order to increase public safety at JFKIA, responsible wildlife management activities have been undertaken to reduce or eliminate bird-aircraft collisions.

Table 4-39

Examples of Damage to Aircraft at JFK International Airport Caused by Bird Strikes

Date	Air Carrier	Length of Flight Delay (hours)	Repair or Replacement Cost (dollars)	Comments
April 16, 1987	American Airlines	Not reported	776,000	Major engine repairs
June 21, 1987	American Airlines	Not reported	28,000	14 blades replaced
September 2, 1988	Japan Airlines	Not reported	Not reported	Four blades damaged
January 7, 1989	Lufthansa	Not reported	Not reported	Six bent blades
May 6, 1990	El Al	Not reported	18,000	Blade and casing damage
May 7, 1991	Northwest Airlines	23	200,000	Tires, brakes replaced
March 10,1992	Japan Airlines	30	>200,000	200,000 lbs fuel dumped
October 24, 1992	Japan Airlines	28	750,000	Replaced fan assembly

Source: USDA/APHIS/ADC Program.

The majority of collisions at JFKIA involve gulls: 47 percent laughing gulls, 37 percent other gulls, and 16 percent nongull bird species. The percentage of laughing gulls colliding with aircraft at JFKIA since 1979 is highly correlated with the growth of a nesting colony of laughing gulls located several hundred yards off the end of one of the airport's runways. JFKIA's integrated bird hazard reduction program, which includes habitat management, patrols, harassment, insect control, and limited shooting, somewhat reduces bird-aircraft collisions at the airport. However, these activities do not reduce the number of gulls flying over the airport between the colony and off-airport feeding and roosting sites.

In 1991, APHIS ADC was requested by JFKIA management to conduct a program to reduce gull-aircraft collisions whereby two to five biologists stationed on airport boundaries would shoot gulls that attempted to cross active runways. The program, conducted in 1991 and 1992, was successful in significantly improving public safety at JFKIA during the period of greatest gull abundance, May to August. The number of gull-aircraft strikes declined by 70 percent and 89 percent in 1991 and 1992, respectively.

As with other wildlife damage control programs, avoided losses attributable to the shooting program at JFKIA are difficult to value because of the lack of data on losses that would occur if the program were not conducted. Information on recorded bird strikes includes pilot reports, birds dead on runways deemed to have collided with aircraft, ground observers' reports, and physical remains on aircraft. The reduction of collisions by 89 percent in 1992, compared to the same period in 1988-90, represents a significant decrease in risk. The annual cost of the APHIS ADC program to JFKIA, approximately $80,000, is more than justified by the significant improvement in human safety provided by the program. The reduction in strikes also reduced equipment loss and damage and runway closures and delays.

The reduction of bird-aircraft collisions for the protection of human lives is the goal of the APHIS ADC program at JFKIA, and in the short term, the shooting program has effectively reduced bird strikes, and therefore damage to aircraft and risks to passenger safety. Gull colony management leading to the eventual abandonment of the site by laughing gulls has been identified as the most prudent course for reducing birdstrikes at JFKIA. The annual killing of large numbers of laughing gulls at the airport is not likely to be effective in eliminating the colony from its present location, since shooting does not appear to condition gulls to avoid flying over the airport. Relocation of the colony, requiring habitat alteration, nest destruction, and other harassment and management techniques may be necessary as a long-term solution. As the control program conducted at JFKIA evolves, it continues to illustrate the effective application of lethal and nonlethal methods in managing near and long-term wildlife threats to human safety.

3. Comparison of the Program Alternatives

a. Approach

Ideally, in a comparison of the five program alternatives, each should be evaluated overall as a national program. Programmatic cost estimates, however, would require a comprehensive accounting of damage control methods and consequences. Other than for the Current Program Alternative, operations and outcomes are necessarily hypothetical. The feasibility of program-wide cost comparisons becomes all the more questionable, given the diversity of wildlife problems addressed and the range and combination of damage control measures available.

Nevertheless, since the alternatives do represent distinct approaches to controlling wildlife damage, an appreciation of their relative costs is of value to programmatic decision making. Nine examples of wildlife damage control are presented, with the aim of illustrating the relative cost effectiveness of the five program alternatives. The examples are detailed in Appendix N, Part II.

Costs for the Current Program Alternative for each example are based on the damages, technical assistance, and direct control measures specified in Appendix N, Part I. (Costs for the endangered species example are taken from the funding agreement between the National Park Service and APHIS.) APHIS ADC expertise and reasonable assumptions underlie the scenarios developed for the four other alternatives. In each case, the costs are broadly divided into those borne by APHIS ADC or other governmental entities involved in animal damage control, and those borne by the affected parties.

In the following sections, limitations of the approach are discussed, the program alternatives for each example are briefly identified, and the relative cost effectiveness of the alternatives is summarized. The scenario assumptions and estimated costs are delineated in Appendix N, Part II.

b. Analytical Limitations

The purpose of the analysis is to compare the relative cost effectiveness of the program alternatives. The cost comparisons are simplified to the extent that only principal direct costs have been estimated. Given the hypothetical nature of the scenarios, consideration of indirect economic impacts would be more speculative than informative. Other limitations of the analysis include the following:

- In each example, the damage control measures were selected in response to current losses or risks. Costs of measures appropriate for preventing losses over the long run have generally not been included. Focusing on the costs of controlling the immediate problem provides a degree of consistency in comparing the alternatives. Nevertheless, it is recognized that for many wildlife damage problems, keeping damage within

manageable levels over the long term is the larger objective. For instance, in the example of sheep predation by coyotes on public land (Example 1), acquisition of guard dogs was advised by APHIS ADC personnel, but their cost was not included in the analysis since their purchase would not have affected current losses. However, in Example 2 the purchase of a guard dog is included in the analysis as a nonlethal method, assuming the dog acquired is trained.

- As with control costs, in each case the damage or risk of damage has been narrowly defined. Considering once more the examples of sheep threatened by coyotes, livestock losses are the most apparent cost, but other impacts include the reduced value of injured animals and the restricted use of forage resources because of management practices intended to decrease predation (Scrivner et al. 1985). Again, direct losses provide a common basis for comparison among the alternatives.
- For the Nonlethal Before Lethal Control Program Alternative, decision rules which would trigger the initiation of lethal methods have been arbitrarily set for the various examples. However, these rules would be a principal determinant of the ultimate cost and effectiveness of the program if this alternative were selected. The formulation and formalization of these rules, given the unique circumstances that characterize each incident of wildlife damage, would be a major undertaking. In the examples presented, thresholds at which lethal methods would be sanctioned are based on reasonable property loss assumptions.
- Similar assumptions are made in the scenarios for the second variation of the Nonlethal Control Program Alternative; that is, when nonlethal methods do not succeed and the affected parties decide to use lethal methods. In these cases, the decision rules would likely be more wide-ranging, given that they would not be guided by program policy but rather based on the personal expectations of affected parties. As Siemer and Decker (1991) observe, thresholds of wildlife damage tolerance are specific to the individual situation.
- Wildlife damage control activities generally involve a combination of Federal, State, local, and private participation. In the examples, costs are identified only as either public or those borne by the affected party or parties. Public costs represent expenditures by APHIS ADC or cooperating entities for alternatives other than the No Action Alternative. For the No Action Alternative, public costs are expenses assumed to be borne by governmental agencies operating in place of APHIS ADC. Affected parties may be either public facilities and institutions, such as airports and schools, or private individuals or businesses.

c. The Examples and Program Alternatives

For each of the nine examples, major assumptions underlying the alternatives are discussed below. The costs summarized in Table 4-40 are presented in detail in Appendix N, Part II.

Example 1. Coyote, Predation on Sheep Grazed on Public Land, Colorado

A rancher grazing sheep on public lands requested assistance because of coyote predation. Two lambs were killed by coyotes in the week prior to the request, from a flock of 1,000 ewes and 1,200 lambs. A review of previous records indicated that predator losses ran as high as 16 percent of the lamb crop for years when control measures were delayed or not implemented, compared to 2 percent of the crop when control measures were undertaken immediately following the initial kills.

For the No Action Alternative, it is assumed that the rancher would turn to a State-administered damage control program. A course of action similar to that of the Current Program Alternative would be followed, except that the use of

M-44 sodium cyanide ejectors would not be possible if its registration were not maintained. Consequently, the immediate threat posed by the coyotes would not be entirely removed.

In the Current Program Alternative, both lethal and nonlethal means are used. Costs are borne not only by APHIS ADC and the affected party, but also by other ranchers who contribute to State and county predator control programs. These program funds are assumed to be drawn upon in the other alternatives of this example as well.

Under the Nonlethal Control Program Alternative, two variations are presented. In the first one, nonlethal methods are assumed to be successful, but the time required would be significantly longer than for the Current Program Alternative and additional losses would be expected. In the second variation, nonlethal methods are assumed to not succeed. Assistance with implementing lethal methods are requested from the State after 6 weeks have passed and livestock continue to be lost. In both cases, a second herder would be hired at the expense of APHIS ADC.

In the Nonlethal Before Lethal Control Program Alternative, lethal methods would be triggered after 6 weeks by continuing losses that exceeded one animal per week. Damage control is assumed to revert to the activities of the Current Program Alternative.

For the Damage Compensation Program Alternative, all verified losses would be compensated. It is assumed that the rancher would initiate controls when he realized that the value of his unverified losses would exceed the cost of the controls.

Based on these scenarios, the Damage Compensation Program Alternative is the most costly one for the ranchers, assuming they contribute to verification costs. The Nonlethal Control Program and Nonlethal Before Lethal Control Program Alternative would be the next most expensive alternatives for producers. Public and total costs are largest for variation 1 of the Nonlethal Control Program Alternative when nonlethal methods are performed until they are assumed to succeed (Appendix N, Part II). The No Action Alternative and Current Program Alternative exhibit the lowest costs.

Example 2. Coyote, Predation on Sheep Grazed on Private Land, Virginia

APHIS ADC personnel verified that two calves and 22 sheep belonging to a cattle and sheep producer were lost to coyotes. The kills occurred in a large fenced pasture adjacent to mountainous terrain and in a small fenced yard directly behind the farm manager's residence. Coyotes were crossing these fences by digging or crawling beneath the bottom wire. Neighboring farms within a two-mile radius also reported lost ewes and lambs.

For the No Action Alternative, the rancher is assumed to have no State-administered wildlife damage control program available, and therefore would hire a private trapper. His livestock losses subsequent to hiring of the trapper are assumed to be greater than those experienced under the Current Program Alternative following initiation of controls.

For the Current Program Alternative, coyote predation is controlled using a combination of lethal and nonlethal methods. "Calling and shooting" is carried out in response to the immediate losses, with reinforced fencing the major nonlethal control measure undertaken.

In the Nonlethal Control Program Alternative, when nonlethal means are assumed to be successful, the additional time required would entail additional losses. When the nonlethal methods are not successful, the rancher is assumed to hire a private trapper after 3 weeks have passed. In both cases, fencing would be reinforced, and a trained guard dog acquired.

In the Nonlethal Before Lethal Control Program Alternative, lethal methods (calling and shooting, and neck-snaring) are assumed to be triggered after 2 weeks by losses exceeding one animal per week.

For the Damage Compensation Program Alternative, all verified losses would be compensated. As in Example 1, the rancher would initiate controls when he realized that the value of his unverified losses would exceed the cost of the controls.

In this example, the Damage Compensation Program Alternative entails the largest public and overall direct costs. Highest private costs occur under the Nonlethal Control Program Alternative (variation 2) when nonlethal methods by themselves are assumed not to succeed. The rancher's costs are lowest under the Current Program Alternative.

Example 3. Cattle Egret, Rookery that Poses Public Health and Safety Risks in a Residential Area, Texas

A cattle egret rookery located on a 19-acre woodlot posed health risks to adjacent residential areas, as well as a general nuisance in terms of noise, odor, feathers, and droppings. APHIS ADC was requested by the county health department to assist with dispersal of the rookery. Nesting activity had been under way for several weeks prior to the request, and the nests held eggs and young. The rookery would continue to grow in size unless dispersed.

For the No Action Alternative, the health department, community leaders, and the landowner are assumed to jointly assess the problem and decide upon a course of action that is the same as for the Current Program Alternative, namely, thinning of the woodlot after the young birds have fledged. No lethal methods of control would be required.

Since nonlethal methods are successful, the Nonlethal Control Program Alternative and Nonlethal Before Lethal Control Program Alternative become the same as the Current Program Alternative.

The Damage Compensation Program Alternative is not applicable, since this is not an agricultural loss situation. The costs of the other alternatives are identical.

Example 4. Cattle Egret, Rookery that Poses Public Health and Safety Risks in an Airport, Arkansas

A cattle egret rookery, located on public airport property in a 10-acre pine/cedar thicket 500 yards from a runway, posed a threat to air traffic safety. Four near-miss air strikes and one collision with three birds that caused minor damage were reported by pilots. The rookery consisted of approximately 2,000 cattle egrets and 100 little blue herons. Nesting activity had taken place for several weeks, and the nests held eggs and young.

For the No Action Alternative, it is assumed that a private firm would be hired by the airport to advise on the removal of the rookery. A course of action like that followed in the Current Program Alternative, combining lethal and nonlethal methods, is assumed: bird frightening devices would be applied, birds removed, nests destroyed, and the vegetation thinned.

Under the Nonlethal Control Program Alternative, the problem would be resolved by an extended period of harassment, followed by thinning of the rookery at a time other than during the nesting season. Existing risks to aircraft and public safety would continue until the harassment and thinning of vegetation were effective.

In the Nonlethal Before Lethal Control Program Alternative, a combination of lethal and nonlethal methods are assumed to be implemented after nonlethal methods alone have been tried unsuccessfully for one month. Risks to aircraft and public safety would continue during the 1 month period.

The Damage Compensation Program Alternative would not be applicable, since this is not an agricultural loss situation.

For this example, costs to the airport and total direct costs are largest for the No Action Alternative—more than twice those of the Current Program Alternative. For none of the alternatives is the cost to APHIS ADC great, since only technical assistance is required.

Example 5. Beaver, Flooding Damage to Trees and Pasture, Texas

A landowner reported a flooded hay meadow, with 15 acres under water and girdled trees along the perimeter of the pasture. The landowner determined that a series of dams built downstream were the cause of the flooding, and suspected nutria. The problem species was identified by APHIS ADC personnel to be beaver. The landowner broke one of the dams in an attempt to lower the water level, but the beavers repaired the dam within 24 hours. No other control measures were attempted by the landowner before requesting assistance.

For the No Action Alternative, it is assumed that the landowner would receive help from a State-administered program. A course of action like that of the Current Program Alternative, that is, trapping of the beavers and destruction of the dams, would be followed. No major cost differences between the two alternatives would be likely.

For the successful variation (variation 1) of the Nonlethal Control Program Alternative, it is assumed that the beavers would be captured and relocated, and the dams destroyed. In the unsuccessful variation (variation 2), only some of the beavers would be captured and relocated. The remaining beavers are assumed to be shot or trapped by a private trapper, and the rebuilt dams destroyed by hand.

In the Nonlethal Before Lethal Control Program Alternative, capture and relocation again would be only partly successful. Trapping and shooting by APHIS ADC personnel would be triggered by failure to capture and relocate all the beavers before 1 month had passed.

For the Damage Compensation Program Alternative, all verified losses would be compensated. Meanwhile, the landowner would attempt to shoot or trap the beavers himself, and assuming he were not entirely successful, would then hire a private trapper.

Costs for the Nonlethal Control Program Alternative and Nonlethal Before Lethal Control Program Alternative are greater than those for the No Action Alternative and Current Program Alternative. The landowner's costs are lowest under the Damage Compensation Program Alternative.

Example 6. Beaver, Girdling Damage to Trees, Texas

Beavers damaged bald cypress trees that had been planted as part of a landscaping project adjacent to a waterway running through the grounds of a Texas university. The maintenance department of the university contacted APHIS ADC for assistance. The damage was thought to be the result of a single transient beaver temporarily using the site, since the damage site would not have been suitable to beavers as a lodging area.

For the No Action Alternative, it is assumed that the university would draw upon the expertise of its own faculty in assessing and resolving the problem. As in the Current Program Alternative, tree protectors would be the means of control.

Since a nonlethal method is successful, the Nonlethal Control Program Alternative and Nonlethal Before Lethal Control Program Alternative become the same as the Current Program Alternative.

The Damage Compensation Program Alternative is not applicable, since this is not an agricultural loss situation. The costs of the No Action Alternative and Current Program Alternative are much the same.

Example 7. Blackbirds, Roost that Poses Public Health and Safety Risks to a School, Kentucky

APHIS ADC received a request from a city health department for assistance with dispersal of a blackbird roost of approximately 500,000 birds. The roost was located on 14 acres of private property adjacent to an elementary school. Several children as well as residents of a neighboring subdivision had contracted histoplasmosis associated with the roost. If the birds were not dispersed, health and safety risks were expected to become worse.

For the No Action Alternative, it is assumed that the community and health department would hire a private firm to assess the problem. The firm is assumed to loan or advise the use of frightening devices combined with thinning and removal of trees. This is the same course of action followed in the Current Program Alternative.

Since nonlethal methods are successful, the Nonlethal Control Program Alternative and Nonlethal Before Lethal Control Program Alternative become the same as the Current Program Alternative.

The Damage Compensation Program Alternative would not be applicable, since this is not an agricultural loss situation.

Direct costs to the city for the No Action Alternative would be more than twice what they are under the Current Program Alternative because they would include the cost of the frightening devices. The No Action Alternative also has the highest total costs.

Example 8. European Starling, Forage Loss and Health Risks to Livestock and Farm Workers at a Dairy Farm, Vermont

A dairy farmer requested assistance with a flock of approximately 300 starlings that were causing feed losses and posing health risks at his free stall dairy facility. Accumulation of droppings on barn structures and livestock as well as in livestock feed was a health risk to the livestock and farm workers. The farmer was also concerned about the amount of feed (high moisture silage) the birds were consuming.

For the No Action Alternative, it is assumed that the farmer would rely on harassment and shooting to control losses but with only limited success. Feed losses and health risks would be reduced but not eliminated.

In the Current Program Alternative, both technical assistance and direct control are provided: hardware cloth is installed as a means of exclosure, and baiting of grain is largely successful in reducing the starling population.

For the two variations of the Nonlethal Control Program Alternative, it is assumed that a combination of exclosure, eye balloons, distress tapes, and pyrotechnics would be used. These methods would be relatively successful in variation 1. In variation 2, when they are assumed not to be successful, the farmer would turn to harassment and shooting as in the No Action Alternative.

In the Nonlethal Before Lethal Control Program Alternative, baiting of grain is assumed to be triggered after one month by continuing feed losses greater than 80 percent of what losses would be if no controls were applied. The size of the starling population would serve as a proxy for grain losses. It is likely that the population would fall sharply with the initiation of nonlethal methods, and then increase again as the birds became accustomed to the frightening devices.

For the Damage Compensation Program Alternative, all verified losses would be compensated. Twice-yearly estimations of the starling population would provide a proxy measure of feed losses.

The Nonlethal Control Program Alternative is the most costly one in this example, for the farmer and overall, and the Damage Compensation Program Alternative is the most expensive alternative for the public. The least costly alternative for the farmer would be the Damage Compensation Program Alternative, assuming he would do nothing to control his losses.

Example 9. Gull Management to Protect Endangered Piping Plovers, New York

A request was received from the National Park Service for assistance in protecting nesting piping plovers at the Gateway National Recreation Area, New York, from herring and great black-backed gulls. The gulls were disrupting plover courtship, territory establishment, and chick feeding activities, as well as preying on eggs and chicks.

Under the No Action Alternative, it is assumed that the National Park Service would carry out a damage control program on its own similar to the Current Program Alternative, that is, harassment activities and addling of eggs. As in the Current Program Alternative, these controls would likely be of only limited success: reducing but not eliminating the number of gulls frequenting and nesting in the area of piping plover nests.

The Nonlethal Control Program Alternative would not be feasible, since the time it would take harassment to be successful could seriously damage the plover population and put at risk other bird species (terns), which are classified as threatened.

The Nonlethal Before Lethal Control Program Alternative would be the same as the Current Program Alternative, since the harassment and destruction of eggs was a two-phase process.

The Damage Compensation Program Alternative would not be applicable, since this is not an agricultural loss situation.

For all applicable alternatives, the cost is the same and is borne entirely by the public sector.

d. Summary

The nine examples of animal damage demonstrate the diversity of problems encountered by APHIS ADC and how specific circumstances in each case determine the methods appropriate for damage control.

Perhaps the major pattern apparent in Table 4-40 are the greater costs of the Nonlethal Control Program Alternative and Nonlethal Before Lethal Control Program Alternative compared to those of the Current Program Alternative, when lethal methods are advisable. In these instances (Examples 1, 2, 4, 5, and 8), costs to the public and affected parties for the former alternatives are generally two to three times greater than under the Current Program Alternative. Greater losses are likely to be experienced when nonlethal methods, which usually require a greater period of time to become effective, must be depended upon first or solely. Moreover, nonlethal methods in themselves can be more costly and less effective when not applied in conjunction with lethal methods.

A second, less dramatic pattern can be seen in comparing the Current Program Alternative and No Action Alternative. The former consistently costs less (or about the same, in those instances in which a State-administered program or other public agency is assumed to fulfill the APHIS ADC role) than the latter. Without Federal and State programs for providing damage control research and assistance, affected parties would need to depend upon their own abilities and resources.

In instances in which the State or community could offer assistance, there is no reason to expect savings in comparison to the Current Program Alternative. Personnel and expertise would shift to the State level, but the research and coordinating functions of a nationwide program are forfeited. Nationwide accountability also is lost.

A third pattern worth noting, though obvious, is that the Nonlethal Control Program Alternative and Nonlethal Before Lethal Control Program Alternative become the Current Program Alternative in those instances in which nonlethal methods are effective. (In the case of the endangered plovers, only the Nonlethal Before Lethal Control Program Alternative is the same as the Current Program Alternative.) This result illustrates the fact that the

Table 4-40

Direct Cost Estimates for Wildlife Damage Examples, by Program Alternative [in dollars]

	Alternative																	
	1. No Action			2. Current Program			3. Nonlethal Control Program (successful)			3. Nonlethal Control Program (not successful)			4. Nonlethal Before Lethal Control Program			5. Damage Compensation Program		
Example*	Public	Affected Party	Total	Public	Affected Party	Total	Public	Affected Party	Total	Public	Affected Party	Total	Public	Affected Party	Total	Public	Affected Party	Total
1	1,920**	1,570	3,490	2,176	1,364	3,540	9,174	2,866	12,040	7,034	2,996	10,030	6,778	2,712	9,490	3,774	3,266	7,040
2	0	8,285	8,285	1,500	5,493	6,995	300	7,675	7,975	300	10,415	10,715	2,100	7,135	9,235	15,840	5,960	12,800
3	300**	1,000	1,300	300	1,000	1,300					Same as Alternative 2						Not applicable	
4	0	79,500	79,500	700	36,000	36,700	700	62,500	63,200		Not applicable		700	48,800	49,500		Not applicable	
5	1,000**	850	1,850	1,000	850	1,850	1,900	1,550	3,450	1,850	1,550	3,400	1,400	950	2,350	1,300	580	1,880
6	0	500	500	100	400	500					Same as Alternative 2						Not applicable	
7	0	12,100	12,100	1,100	5,300	6,400					Same as Alternative 2						Not applicable	
8	0	2,270	2,270	150	1,270	1,420	720	3,650	4,370		Not applicable		870	2,960	3,830	2,390	0	2,390
9	77,900***	0	77,900	77,900***	0	77,900				Not feasible				Same as Alternative 2			Not applicable	

Notes:

*1. Coyote, predation on sheep grazed on public land, Colorado.

*2. Coyote, predation on sheep grazed on private land, Virginia.

*3. Cattle egret, rookery that poses public health and safety risks in a residential area, Texas.

*4. Cattle egret, rookery that poses public health and safety risks to an airport, Arkansas.

*5. Beaver, flooding damage to trees and pasture, Texas.

*6. Beaver, girdling damage to trees, Texas.

*7. Blackbirds, roost that poses health and safety risks to a school, Kentucky.

*8. European starling, forage loss and health risks to livestock and farm workers at a dairy farm, Vermont.

*9. Gull management to protect endangered piping plovers, New York.

** Assumed expenditures by State, county or local agencies, in the absence of APHIS ADC.

*** Paid by the National Park Service.

Source: Based on APHIS ADC field data and cost estimates.

Nonlethal Control Program Alternative and Nonlethal Before Lethal Control Program Alternative are in fact subsets of the universe of approaches that are possible using the APHIS ADC decision model.

In five of the nine examples, in which non-agricultural damages were addressed, the Damage Compensation Program Alternative would not be applicable. This result indicates how narrowly the benefits of the Damage Compensation Program Alternative would be applied. Affected parties would be on their own in the many instances of non-agricultural damage or risk of damage—a costly situation, as shown in the examples by estimated expenditures under the No Action Alternative.

Compensation of verifiable agricultural losses would nevertheless be extremely expensive. In all likelihood, compensation would be limited to available program funding, as is generally the case in States having compensation programs. Receipt of benefits would be more a function of the position of one's application in the damage claims queue than of damages borne, and producers would be compensated for only a fraction of total damage. Moreover, as indicated in the examples for which the Damage Compensation Program Alternative would be applicable, verification costs would be major.

In conclusion, the cost advantage of the Current Program Alternative is apparent in these examples of wildlife damage control.

- If an APHIS ADC program did not exist, many of the States would likely increase their wildlife damage services. Cooperative funds currently being collected by many States and used in the current program could simply be redirected to new programs administered by the States. There is no reason to expect that expanded State programs would be more cost effective than damage control operations now commonly implemented within the Cooperative Agreement framework. Where States or communities did not provide adequate services, affected parties would bear significantly higher private costs.
- The present APHIS ADC program uses or recommends nonlethal methods in instances in which they are considered likely to be effective. Attempts to impose nonlethal methods as a first option where they are unlikely to be effective would result in higher costs, as a result of additional losses and/or larger expenditures for control. In addition, persons or entities who sustain damage would be less likely to accept or cooperate with such a program.
- A compensation program would be extremely costly, even when limited to agricultural losses.

The examples presented show that the resources and flexibility of the Current Program Alternative enable wildlife damage costs to be more effectively contained than would be the case for the other alternatives.

4. Direct and Indirect Impacts of the Alternatives

The preceding two sections have demonstrated the economic worth of the present wildlife control program and indicated the relative cost effectiveness of the program alternatives. In this final part of the economic assessment, direct and indirect impacts of the alternatives are reviewed.

Direct impacts, as defined by the Council on Environmental Quality (CEQ) regulations (40 CFR 1508.8(a)), are those effects that are caused by the action and that occur at the same time and place as the action. For the APHIS ADC program's predator damage control activities, for instance, savings realized from reducing livestock losses are direct impacts. Improving airport safety by excluding or removing wildlife from airport runways or flight paths is another example of a direct impact.

Indirect impacts, according to CEQ (40 CFR 1508.8(b)), are those effects caused by the action that occur later in time or removed in distance from the action, but are still reasonably foreseeable. Two examples are lower market prices for agricultural commodities due to better wildlife damage control, and increased (or decreased) production on one farm because of damage control activities on neighboring farms.

In the following comparison of the direct and indirect economic effects of the alternatives, the discussion is divided into 1) impacts on affected parties, and 2) public impacts through operations of APHIS ADC and other governmental entities involved with wildlife damage control.

a. Direct Impacts on Affected Parties

The direct economic effects of wildlife damage are essentially the losses or risks suffered and the cost of actions taken to avoid or minimize those losses or risks. Consequently, the impacts of an APHIS ADC program for affected parties are resulting changes in their losses/risks and in their expenditures for preventive or reactive measures. These impacts occur in all areas of APHIS ADC operation, including activities for protecting crops and livestock, averting property destruction in the residential and industrial sectors, preventing the spread of disease, and reducing the risk of aircraft accidents.

Considering first the losses and risks due to wildlife damage, different outcomes could be expected from the five program alternatives. The No Action Alternative, if the APHIS ADC program were not replaced by State, local, or other Federal agency programs, would offer parties at risk the least protection from direct losses. Where wildlife threatens human health and safety, the affected parties would bear all potential losses, including property damages and insurance and health care costs. Agricultural producers would have to rely upon their own or hired expertise in preventing or minimizing losses. More likely, other governmental agencies would assume some of the damage control responsibilities currently shouldered by the APHIS ADC program.

For the three alternatives for which the APHIS ADC program would provide loss-avoiding measures, the relative success of the programs would likely parallel their relative adaptability. The Current Program Alternative, offering the widest range of choices in the application of technical assistance and direct control methods, could be expected to most efficiently minimize losses and risks. The Nonlethal Control Program Alternative and Nonlethal Before Lethal Control Program Alternative, restricted by the methods permitted and their order of application, would likely result in higher losses as indicated in the comparison of alternatives in the previous section.

Payments under the Damage Compensation Program Alternative would partially offset agricultural losses, but unverified losses would still be borne and could become significant without a damage control program. Moreover, for nonagricultural wildlife damage, the Damage Compensation Program Alternative would become the No Action Alternative.

Turning to the second type of direct economic effects on affected parties, that of damage control expenditures, the alternatives compare similarly. Under the No Action Alternative and Damage Compensation Program Alternative, costs would be fully borne by the affected parties unless State, local, or other Federal agencies could be called upon. An important negative impact of these two alternatives compared to the Current Program Alternative would be the absence of APHIS ADC funds for research and dissemination of information on control methods, although the Extension Service would provide some of these services. In addition, many pesticide registrations supported by APHIS ADC research would be lost.

For the Current Program Alternative, Nonlethal Control Program Alternative, and Nonlethal Before Lethal Control Program Alternative, damage control costs would be partly paid by the APHIS ADC program. Direct costs to affected parties under the Nonlethal Control Program Alternative and Nonlethal Before Lethal Control Program Alternative

would probably be greater than for the Current Program Alternative, because in most cases, damage control activities of the two former alternatives would take longer to succeed (if successful at all) when timely application of lethal methods is more appropriate.

b. Indirect Impacts on Affected Parties

Indirect impacts of the alternatives can be considered largely in terms of losses and risks that would be borne by third parties. For the Damage Compensation Program Alternative, in which affected parties would be on their own in controlling animal damage, no indirect impacts would be attributable to the APHIS ADC program. Similarly, effects on third parties in the No Action Alternative would occur only if State, local, or other Federal agencies assumed the role of APHIS ADC.

For the other three program alternatives, control measures would be undertaken and third parties would be affected. For example, by helping to prevent the spread of disease by rodents and other wildlife, costs of health care insurance are positively affected, even though the individuals paying the lower insurance premiums may never suffer direct losses. Comparing predator control activities of the Current Program Alternative and Nonlethal Control Program Alternative illustrates how indirect impacts may be positive or negative, depending on the methods allowed: A lethal predator damage control program on one rancher's property could reduce the likelihood of losses by neighbors, whereas a nonlethal control program might increase that likelihood.

For many agricultural producers, APHIS ADC assistance with wildlife damage control can mean the difference between remaining or not remaining in business. These producers would not be able to absorb increased losses from wildlife damage or added costs of control to prevent those losses. Their continued operation contributes to the economies of their local communities. Local businesses, therefore, are indirect beneficiaries of APHIS ADC activities.

From a more market-wide perspective, loss-reduction impacts of a APHIS ADC damage control program may include effects on prices, as has been exemplified above for the lamb industry. Reduced losses means greater supply, which may translate to lower prices for consumers (and producers). This is a simplistic description of price formation; the markets for most commodities are far from perfectly competitive, given the price supports, international trade barriers, and other policy mechanisms that commonly distort supply and demand. Nevertheless, there are positive price effects of wildlife damage control, even though they may be marginal and not readily apparent.

c. Direct Public Impacts

Direct public impacts mainly take the form of program expenditures. Only the No Action Alternative would not show an impact at the national level (unless through a different Federal program), although there may be impacts at the State and local levels. If other governmental entities were to assume animal damage control responsibilities, costs to the public could be collectively comparable to or even greater than that spent currently, given the economies of size of the present APHIS ADC program.

For the alternatives having a APHIS ADC program, the Current Program Alternative is likely to be the least costly to the public. As noted earlier, damage control activities under the Nonlethal Control Program Alternative and Nonlethal Before Lethal Control Program Alternative, except in instances in which nonlethal methods are appropriate, are likely to take longer and have lower success rates.

The Damage Compensation Program Alternative would be prohibitively expensive, with budgeted funds, in effect, determining expenditure levels. Besides funds for compensation, costs of administering loss verification and claim processing would be considerable.

d. Indirect Public Impacts

Indirect impacts for the public can be considered in terms of effects on other governmental costs of each of the APHIS ADC program alternatives. These effects could be large or small, under the No Action Alternative and Damage Compensation Program Alternatives, depending on the extent to which animal damage control operations would be performed by other governmental entities. For the three alternatives in which APHIS ADC would carry out damage control measures, the Nonlethal Control Program Alternative and Nonlethal Before Lethal Control Program Alternative could lead to larger indirect public impacts than would the Current Program Alternative, if dissatisfaction by affected parties with the relative lack of adaptability of the former alternatives were to create demand for more appropriate approaches by State, local, or other Federal agencies.

If wildlife-attributed losses were to occur for which there were public liability (for example, damage to a farmer's crops or human injury at a public facility), costs of compensation would be an indirect effect of the program alternative, or more precisely, of the alternative's inadequacy. For example, a public airport might be held liable by passengers for injuries resulting from an aircraft colliding with birds. Such incidents could be expected to occur most frequently when no governmental wildlife controls are undertaken (the No Action Alternative and Damage Compensation Program Alternatives), and least frequently under the Current Program Alternative, when the most appropriate combination of lethal and nonlethal methods are used.

e. Summary

The economic impacts that have been described are depicted in Table 4-41. Qualitative indicators are used to provide a relative measure of economic consequences across the program alternatives. The table shows whether one program alternative would likely have a larger, smaller, or intermediate impact, in comparison to the other alternatives. Among the impacts that can be highlighted:

- The No Action Alternative would not necessarily have negligible public costs, because States and other jurisdictions would likely enlarge their wildlife damage control operations. In cases where the affected parties would be left to their own devices, their costs would be high. Direct public costs also could be great if unsound actions by affected parties (such as misuse of chemical methods) were harmful to the environment.
- Public expenditures under the Damage Compensation Program Alternative would be costly, with losses compounded by the absence of Federal involvement in reducing damages. Direct and indirect impacts for affected parties would be similar to those under the No Action Alternative, except for the compensation of verified agricultural losses.
- For the three alternatives that allow technical assistance and/or direct control, the Current Program Alternative would best limit direct and indirect costs, when a combination of lethal and nonlethal methods would be most appropriate. In terms of both avoided losses and damage control expenditures, it is the most cost efficient of the alternatives. Impacts of the three alternatives would be the same in those instances when only nonlethal methods would be appropriate.

Table 4-41

Direct and Indirect Economic Impacts of the Program Alternatives

Impact	*Likely Magnitude of Impact, Relative to the Other Program Alternatives*				
	No Action	Current Program	Nonlethal Control Program	Nonlethal Before Lethal Control Program	Damage Compensation Program
Direct Impacts on Affected Parties					
Agricultural losses avoided or risks reduced	smaller	larger	intermediate	intermediate	0*
Nonagricultural losses avoided or risks reduced	smaller	larger	intermediate	intermediate	0
Damage control expenditures	smaller or larger**	smaller	intermediate	intermediate	smaller or larger**
Indirect Impacts on Affected Parties					
Agricultural losses avoided or risks reduced for third parties	smaller	larger	smaller	intermediate	smaller
Nonagricultural losses avoided or risks reduced for third parties	smaller	larger	smaller	intermediate	0
Positive contribution to the local economy	smaller	larger	intermediate	intermediate	intermediate
Direct Public Impacts					
APHIS ADC program expenditures	0	smaller	intermediate	intermediate	larger
Potentially harmful environmental effects	larger	smaller	intermediate	intermediate	larger
Indirect Public Impacts					
Non-APHIS ADC program expenditures	smaller or larger**	smaller	intermediate	intermediate	smaller or larger**

Notes: *Verified losses would be compensated, but not avoided other than through private or non-APHIS ADC program action.

**Expenditures would depend upon inclinations of the affected party and public sector assistance available from non-APHIS ADC programs. State and local damage control programs would keep costs lower for the affected party. Conversely, the absence of such programs (smaller indirect public impacts) would mean higher expenses for the affected party.

E. Sociocultural Impact Assessment

The sociocultural environment for this EIS is discussed in Chapter 3. In conducting the sociocultural assessment, attention was focused on presenting the primary issues as identified in scoping and Congressional testimony. Central sociocultural issues include concerns regarding humaneness and ecological impacts and the effect of the program on the viability of the agricultural community. The following sections present these major sociocultural issues relevant to managing wildlife damage and how these issues might differ among the alternatives.

1. No Action Alternative

Without a Federal program, lack of expertise in the methods to control wildlife damage could result in substantially more injury or death to target and nontarget wildlife than the Current Program Alternative. Nonselective control could be particularly detrimental to rare wildlife species. The present Federal program is accountable to the public and influenced by social values, including concerns for humane treatment of animals and sound ecological management.

In contrast, individuals are legally less constrained in their actions. Individuals and private organizations are likely to control wildlife damage by methods that they perceive to be the most cost effective, with less regard for the humaneness and ecological consequences of their actions. Greater losses of nontarget wildlife could diminish opportunities for consumptive and nonconsumptive use of wildlife.

Wildlife damage control methods implemented by the individual or local organizations also may present a public health and safety danger. Use of some methods by untrained individuals could increase the possibility of accidents. Additionally, in the absence of APHIS ADC assistance, affected individuals might be more likely to risk using illegal methods. This would pose a safety hazard to the user and the general public.

a. Humaneness

The issue of humaneness in the killing or capturing of wildlife is important to many people and is discussed in detail in the sociocultural section of Chapter 3. Humaneness is an individual's perception of the impact of an action, and individuals may perceive the humaneness of various actions differently. Many organizations, including environmental and animal welfare organizations, are concerned that some methods used by the APHIS ADC program to control wildlife damage are inhumane.

However, in the absence of a Federal program, actions taken by individuals to control wildlife damage may be even less humane. Without a Federal program that is accountable to the public and upon which humane interest groups focus their opposition, fewer people may be aware of actions taken by individuals that may be perceived as inhumane. Thus the perception of inhumane activities will be reduced, although actual occurrence those activities may increase.

Humane methods of controlling damage should minimize the perceived pain and suffering of individual animals. Without Federal research into improved methods of control, more humane methods may be less likely to appear. Furthermore, research to improve the selectivity of capture devices for target species reduces unnecessary capture of nontargets animals. Under the No Action Alternative, more nontarget animals will be affected.

Some groups and individuals believe that uncontrolled wildlife damage is inhumane. For example:

- Allowing a coyote to cause suffering by injuring and killing other wildlife and livestock is more inhumane than killing that coyote.

- Allowing a red fox to kill unprotected flightless birds is more inhumane than killing that red fox.
- Allowing a beaver to displace other wildlife by flooding, likely causing their eventual death, is more inhumane than killing that beaver.
- Allowing a raven to eat the eye out of a ewe who has laid down to have her lamb is more inhumane than killing that raven.
- Allowing a gull to cause human injury and death resulting from an aircraft collision is more inhumane than killing that gull.

The issue of humaneness is largely a matter of perception. Wildlife damage control activities tend to illuminate an issue society would rather not think about. This issue is the fact that animals die. Wildlife damage control is traditionally perceived as inhumane. APHIS ADC openly reports the numbers of animals killed by the program's activity. These numbers have been used by humane groups to imply that APHIS ADC is consuming a nonrenewable resource.

Many wildlife populations that APHIS ADC deals with have remained stable with or without APHIS ADC's influence. Millions of animals die each year regardless of wildlife damage control. The reproductive capacity of most species vastly exceeds the size of its carrying capacity. As a result, the excess population dies off every year. Suffering of wildlife cannot be eliminated or limited by stopping wildlife damage control activities.

Wildlife population declines have little to do with APHIS ADC's activities and much more to do with changes in habitat. These changes in habitat are largely the result of other human activities such as establishing farms, laying highways, or building housing communities.

b. Ecological Interest Groups

Ecological interest groups generally would prefer an alternative that minimizes or eliminates lethal wildlife damage control. The No Action Alternative would stop such activities by APHIS, but not by other agencies or individuals. They would be interested in biological effects as discussed in the biological impact assessment in this chapter. No data exist from which to decisively conclude whether more or less wildlife would be killed to control damage without a Federal program.

c. Service Recipients

Individuals or groups sustaining wildlife-caused losses would either need to resolve the problem themselves, accept the loss, or contract with other agencies or individuals to have the problem resolved. They would be generally displeased with the elimination of the present program.

Of all agricultural communities, the program probably affects the ranching industry the most, particularly the sheep industry. In some parts of the country, the program may be necessary to maintain some agricultural operations (Kensing 1982). Many ranchers probably would not attempt to raise sheep in some areas without the use of direct wildlife damage control methods. If ranch operations were reduced or ceased, the adjacent rural communities could be adversely affected by the loss of a tax base and the infusion of capital that these operations provide to local economies. Additionally, in certain situations land management goals (e.g., brush control and reforestation) could not be achieved as effectively without sheep grazing. As a result, the aesthetic quality of these lands could be diminished, and this could adversely impact public use of these lands.

Under the No Action Alternative, costs to agricultural producers and other individuals affected by wildlife damage would probably increase wherever State or local agencies did not replace the APHIS ADC program. The increased costs would result from the

individual's attempts to control damage without the assistance of APHIS ADC personnel. Without professional help, individuals would likely be less effective in controlling wildlife damage. Repeated, costly but ineffective damage control attempts could significantly impact some individuals. The economic burden could be substantial and cause stress and financial hardship, particularly if factors other than wildlife damage compound agricultural producers' problems and make their enterprises marginally profitable. If the additional burden forces the producer out of business, the agricultural community could also be adversely affected.

d. Other Sociocultural Issues

If APHIS ADC did not exist, it would not conflict with private enterprise for wildlife damage control services. However, conflict could develop between the private sector and other government agencies to the extent that the agencies accept the wildlife damage control responsibility previously held by APHIS that might have conflicted with the private sector. Additionally, the concern about APHIS-supervised personnel taking animals that would otherwise be available to fur trappers would be eliminated because APHIS would no longer kill animals.

In the absence of an APHIS program under the No Action Alternative, additional Federal, State, and local mechanisms could be required to regulate the use of wildlife damage control methods conducted by agricultural producers and others sustaining wildlife-caused damage. Also, additional public safety officers, conservation officers, or game wardens may be necessary for surveillance or enforcement to prevent unauthorized killing of wildlife or use of pesticides.

In summary, implementation of a No Action Alternative would likely have greater adverse sociocultural impacts because of more negative biological impacts than the Current Program Alternative. However, without a Federal agency to maintain records of actions taken to reduce damage, the interest groups concerned about animal welfare and the killing of wildlife may be less aware of actions taken to reduce wildlife damage and consequently less aware of adverse wildlife and ecological impacts.

2. Current Program Alternative

With respect to the Current Program Alternative, the primary interest groups may retain opinions similar to those they now hold. However, these groups may modify their opinions of the program as the program continues to evolve and acquires methods that humanely and effectively resolve damage problems with fewer interactions with wildlife.

a. Humaneness

The issue of humaneness in the killing or capturing of wildlife is important to many people (see sociocultural section of Chapter 3). Many organizations including environmental and animal welfare organizations are concerned that some methods used by the APHIS ADC program to control wildlife damage are inhumane. The APHIS ADC program conducts research to improve the selectivity of capture devices for target species. The use of special pan tension devices, species-specific lures, and other methods have resulted from such research. Research that improves the selectivity of capture devices for target species reduces unnecessary pain and death for nontargets. Reduced capture of nontarget animals would generally be considered more humane.

Under the Current Program Alternative, inhumane killing of livestock by wildlife is reduced. Additionally, many service recipients are concerned about ecological protection and animal welfare and support initiatives to provide methods that are humane because they find them consistent with their personal values and ethics.

The killing of wildlife represents one of the divisive areas of controversy surrounding the present program. Controlling wildlife damage by killing members of target populations or by other measures aimed at reducing the abundance of local target populations results in a great deal of animosity between animal rights groups and APHIS ADC program supporters. The program has evolved toward the use of more selective control techniques. The Current Program Alternative's emphasis is to continue to work to resolve wildlife damage in ways that minimize human interactions with wildlife.

The goal of humane organizations is to minimize pain inflicted on animals and unnecessary killing of animals. Most animal welfare organizations do not oppose the concept of wildlife damage control but support more restrictions on control methods perceived as inhumane, more research into improved methods of control, and greater application of nonlethal controls such as guard dogs. They maintain that the program needs to be more sensitive to animal pain and suffering. Many animal welfare organizations also feel that control should be applied only to specific situations and limited to the damage-causing individual animals rather than populations. In these instances, their interests are similar to those of ecological interest groups.

b. Ecological Interest Groups

Many organizations feel that wildlife damage control should be applied only to specific situations and that the program should be more aware of and concerned about the risks of releasing toxicants into the environment. The risk assessment (Appendix P) indicated a low risk of program activities. However, many people find even low risks over which they feel they have no control unacceptable (Sandman 1990). These organizations favor an increased emphasis on improved animal husbandry techniques and nonlethal methods of wildlife damage control.

Ecological interest groups may view the program more positively as their members become more aware of the Federal program's efforts (1) to balance the protection of wildlife with the alleviation of wildlife-caused damage and threats to human health and safety, and (2) to assist in the recovery of T&E species.

Debate continues on the extent to which humans should attempt to "balance nature" or "let nature take its course" (see Chapter 3, Sociocultural Environment). Individuals brought to a high level of understanding of human-induced changes of the landscape and in natural processes may appreciate the necessity of management actions to adjust the balance of nature in favor of those components of the ecosystem that have been disadvantaged by human-induced changes in natural processes (Soule 1990, Ehrenfeld 1991). When society achieves that understanding, management actions designed to restore that balance will receive more support from the public.

In contrast to most ecological interest groups, animal rights organizations generally believe that killing, injuring, harassing, or manipulating wildlife for the benefit of humans is wrong. Animal rights organizations may be expected to oppose any wildlife damage control that interacts with wildlife.

Wildlife predation on livestock in wilderness areas results in a few requests for assistance from the APHIS ADC program. Assistance is provided only with concurrence of the land management agency (such as BLM) and in accordance with State law. During scoping for this EIS, APHIS direct control activities to protect livestock were identified as conflicting with certain human uses of wilderness areas. Recreationists (e.g., backpackers, campers, etc.) may consider the presence of program personnel or equipment to adversely affect the aesthetic quality of their wilderness experience.

Livestock grazing is considered by some to be detrimental to the aesthetic quality of wilderness areas. Persons who oppose livestock grazing in wilderness areas also may believe that the program tends to perpetuate grazing in these areas by providing damage control assistance to livestock producers. Therefore, persons who oppose livestock grazing in

wilderness areas also are likely to oppose present program efforts to protect livestock in such areas. However, wildlife damage control in wilderness areas constitutes a very small fraction of all present program activities.

c. Service Recipients

The many segments of society that benefit from the program generally feel that the program should be strong and have a major role in reducing wildlife damage affecting their interests. Many ranchers and farmers believe that wildlife adversely affecting their operation by killing livestock, eating crops, or competing with livestock for available forage should be controlled and that the cost of the control should be borne by the public that owns and benefits from the wildlife. However, many service recipients are concerned about ecological protection and animal welfare and support initiatives to provide methods that are humane and ecologically sound because they find them consistent with their personal values and ethics.

Program assistance to farmers and ranchers is intended to reduce damage caused by wildlife. To the extent that the program is successful or perceived to be effective, economic loss and stress are reduced for individual farmers and ranchers. Numerous factors threaten the U.S. agricultural economy, including foreign competition, unfavorable prices, labor scarcity, and wildlife damage. Of these, farmers and ranchers feel they may be able to control wildlife damage. Many feel that they need continued access to APHIS personnel and wildlife damage control methods to stay in operation (Kensing 1982). Others favor more cost effective methods of control than those currently used by the program. They feel that Federal restrictions on the use of control chemicals, such as compound 1080 and other toxicants, prevent them from adequately protecting their operations.

An APHIS ADC program objective is to protect American agriculture from losses due to wildlife damage. The present program focuses on responding to expressed needs from all portions of the agricultural community. The present program is supporting the viability of the agricultural community by reducing the adverse effects of wildlife-related losses of crops and livestock.

Crop and livestock producers are the primary recipients of program assistance. During the scoping process for this EIS, many producers reported a high level of frustration with the extent of the losses and with the restrictions on chemical control methods that they believe are necessary to reduce losses.

In addition to agricultural concerns, the program protects many urban interests. As the country becomes more urbanized and more farmland is converted to residential tracts, the potential for urban conflicts with wildlife increases. Requests for protection from wildlife damage at airports, homes, businesses, buildings, gardens, golf courses, and many other public and private facilities are increasing. Since the program was moved back to USDA, the APHIS ADC program has increased its protection of nonagricultural resources, particularly in the eastern United States.

3. Nonlethal Control Program Alternative

Humane and animal rights groups would prefer nonlethal over lethal methods. Although this alternative would be less effective than the Current Program Alternative, these groups would probably be less concerned about increased costs of the Federal program or reduced ability to control damage in a cost effective manner. However, if other agencies or individuals resort to lethal methods that are less humane and kill or injure more nontarget animals than the Current Program Alternative, these groups would be less satisfied with the outcome. Because the Federal program would neither employ lethal methods nor maintain records on animals killed by others in attempts to reduce wildlife caused

damage, the public may be less informed of these outcomes, and consequently feel better because they are unaware of the more adverse outcomes. Hence, negative perceptions may be reduced, although actual adverse impacts may be greater.

a. Humaneness

This alternative superficially appears to be the most humane. However, lethal control involving a quick and relatively painless death may be more humane than "nonlethal" methods in which the problem animal is not killed by program personnel but dies from circumstances related to damage reduction methods.

An example would be relocating problem animals rather than killing them. Although removing them from the area where they are causing problems might seem like the humane alternative, studies show that relocated animals do not remain in the new area and are more likely to die (see Biological Impact Assessment on p. 4-9). Therefore, the humaneness and efficiency of relocation of abundant and widely distributed wildlife species is of dubious value.

Building a highway or housing division is lethal to wildlife by virtue of the reduction in carrying capacity of the habitat. Any wildlife damage management techniques that rely on reducing carrying capacity or increasing the load on the carrying capacity of other habitat are similarly lethal to wildlife. Reduction in carrying capacity can appear as benign as building a fence to keep coyotes out of the sheep pasture or extend to an extreme of turning rangeland into farmland. If that food and cover are no longer available to the coyote population, the population will shrink accordingly. Thus, reduction in carrying capacity is lethal to coyotes.

The elimination of lethal tools will result in more wildlife damage. This may be viewed as inhumane (see Humaneness under No Action Alternative, p. 4-129).

The program currently does research on nonlethal methods of control and employs nonlethal methods when they are appropriate. In these situations, the humaneness of the program would not differ from the Current Program Alternative.

b. Ecological Interest Groups

Ecological interest groups would prefer nonlethal over lethal methods, unless the nonlethal methods are ecologically unsound. For example, relocating animals without adequate controls for diseases and parasites can cause the relocation of more than just the problem animal. Hence, ecologists with an awareness of these issues in conjunction with the practicality and humaneness of the method would not support nonlethal methods such as relocation. Their concerns are more likely to be with the health and well-being of the species population or entire ecosystem. Further, if other agencies or individuals resort to lethal methods that kill or injure more nontarget animals, these groups would be less satisfied with these outcomes. Hence, the level of support and acceptability of this alternative to ecological interests would not necessarily be great.

c. Service Recipients

Under the Nonlethal Control Program Alternative, current service recipients (see Chapter 3 for a partial list) would be negatively impacted because nonlethal methods alone are often not capable of preventing or stopping wildlife damage (see Appendix J). Even though other agencies and organizations are expected to ultimately use lethal controls to reduce wildlife damage, those sustaining wildlife damage would still feel some negative impacts from a totally nonlethal program conducted by APHIS. Some cooperators currently using APHIS services probably would shift to other programs that would not be required to use nonlethal methods, because they could reduce wildlife-caused damage or wildlife-induced hazards more efficiently.

With a nonlethal program, farmers and ranchers may have less confidence in their ability to avoid serious wildlife losses. The likelihood of increased economic loss under the Nonlethal Control Program Alternative could lead to increased stress for those who rely on agricultural resource production for their livelihood. The need to control wildlife damage as perceived in agricultural community is discussed in the sociocultural impacts section of Chapter 3.

4. Nonlethal Before Lethal Control Program Alternative

In situations where a nonlethal approach is practical, this alternative would resemble the Current Program Alternative. In those situations where nonlethal methods are unlikely to be successful, outcomes would more closely resemble the No Action Alternative. In the second set of situations, producers may sustain additional damage and be more likely to attempt to resolve the problem themselves or call upon other programs that are not mandated to initially use nonlethal approaches. However, because nonprofessionals may be more likely to resort to lethal methods that may kill or injure more nontarget animals, animal humane and animal rights groups would be less satisfied with the outcomes. Because the Federal program could still ultimately employ lethal methods, the Federal program would maintain records on animals killed, and would remain a focus of dispute for groups that oppose the killing of wildlife to reduce wildlife caused damage. Therefore, some of the negative perceptions of the program probably would persist and be emphasized by the present program opponents.

a. Humaneness

The issue of humaneness is a primary reason why this alternative is being considered. Humane and animal rights groups would prefer nonlethal over lethal methods. This alternative would assure that nonlethal methods of controlling wildlife-caused damage would be used initially. Also, the program currently does research on nonlethal methods of control and employs nonlethal methods when they are appropriate. The degree of humaneness of this alternative may differ little from the Current Program Alternative because APHIS ADC's Code of Ethics specifies that "an ADC employee. . . will choose the most humane, selective and effective control techniques" (ADC Directive 1.301 dated 3/26/93).

Humane and animal interest groups would probably favor an approach that required attempting nonlethal methods, even if it increased the costs of the Federal program and reduced the program's ability to control damage in a cost effective manner.

b. Ecological Interest Groups

Ecological interest groups would prefer nonlethal over lethal methods, unless the nonlethal methods are ecologically unsound. For example, relocating animals without adequate controls for diseases and parasites can cause the relocation of more than just the wildlife. Hence, ecologists with an awareness of disease issues as well as the practicality and humaneness of the method would not support nonlethal methods such as relocation. Their concerns are more likely to be with the health and well-being of the population or entire ecosystem. Further, if other agencies or individuals resort to lethal methods that kill or injure more nontarget animals, these groups would be less satisfied with these outcomes. Hence, the level of support and acceptability of this alternative to ecological interests would not necessarily be great.

In situations where a nonlethal approach is practical, this alternative would resemble the Current Program Alternative. In other situations where nonlethal methods are unlikely to be successful, outcomes would more closely resemble the No Action Alternative. In

these situations, resource owners would sustain unnecessary damage and may be more likely to attempt to resolve the problem themselves or call upon other programs that are not mandated to initially use nonlethal approaches. However, because nonprofessionals may be more likely to resort to lethal methods that may kill or injure more nontarget animals, animal humane and animal rights groups would be less satisfied with the outcomes. Because the Federal program could still ultimately employ lethal methods and would maintain records on animals killed, it would remain a focus of dispute for groups that oppose the killing of wildlife to reduce wildlife-caused damage. Therefore, some of the negative perceptions of the program probably would persist and be emphasized by the present program opponents.

c. Service Recipients

Under the Nonlethal Before Lethal Control Program Alternative, APHIS ADC service recipients would be negatively impacted because nonlethal methods alone are often not capable of preventing or stopping wildlife damage. Producers would suffer more cumulative damage because damage may continue while nonlethal methods are tried, and producers may feel more stress and frustration while they are sustaining losses and in anticipation of sustaining losses. Additional adverse health and safety impacts from wildlife may increase. Service recipients would probably be more likely to seek assistance from other sources or attempt to solve the problem without professional assistance.

With a Nonlethal Before Lethal Control Program Alternative, farmers and ranchers would have less confidence in their ability to minimize serious wildlife losses. The likelihood of increased economic loss under this alternative could lead to increased stress in those who rely on agricultural resource production for their livelihood. Sociocultural impacts to the agricultural community are likely to be greater than those under the Current Program Alternative.

5. Damage Compensation Program Alternative

For damages involving agricultural resources, this program would differ from the Current Program Alternative because all resources would be used on verification of and compensation for losses rather than damage reduction. For nonagricultural wildlife conflicts, this alternative would resemble the No Action Alternative.

a. Humaneness

Compensation for agricultural losses would be viewed favorably for humane reasons. The goal of animal welfare organizations is to minimize the pain inflicted on animals and the unnecessary killing of animals. One of the principal arguments of those who favor a Damage Compensation Program Alternative is that wildlife injuries and deaths to protect agriculture would be eliminated. However, livestock injuries and deaths would increase significantly. This assumes that producers would be adequately compensated for their losses and that farmers and ranchers would not kill wildlife to protect their agricultural resources. However, these assumptions would not always be met. Not all producers would participate in a compensation program. Some individuals probably would protect their livestock or crops by any available means, including lethal methods. Others would wait until they realize that the system will fail to pay for their actual losses. In addition, wildlife damage to nonagricultural resources would not be compensated, and affected agencies or individuals probably would continue to use lethal methods as necessary to protect these resources.

If compensation is not adequate, some producers would employ those measures they feel most appropriate to alleviate their wildlife damage problems. The percentage of such producers would increase as the level of compensation drops below the full value of the lost resources. In such situations, the impacts may resemble those expected under the No Action Alternative.

b. Ecological Interest Groups

One of the principal arguments of those who favor a Damage Compensation Program Alternative is that wildlife injuries and deaths would be eliminated. As discussed under humane above, this may not necessarily occur. Given the high cost of estimated wildlife caused losses (nearly $500 million dollars in 1989, see economics section of Chapter 3), full compensation is unlikely to remain a economically viable option. However, if full compensation was available, populations of wildlife causing damage would probably increase along with levels of damage.

If compensation is not adequate, some producers would employ those measures they feel most appropriate to alleviate their wildlife damage problems. In such situations, the impacts may resemble those expected under a No Action Alternative, and wildlife, the biological environment, and public health and safety could be adversely affected.

c. Service Recipients

Under this alternative, compensation would only be paid to agricultural producers who sustain wildlife-caused losses. Other nonagricultural service recipients would no longer be served by the program and the outcome for these groups would be similar to the No Action Alternative.

The influence of the Damage Compensation Program Alternative on the quality of rural life would depend on the adequacy of compensation. Under existing compensation programs, farmers and ranchers complain that they report only a small portion of damages because of the paperwork involved. Additionally, only verified losses would be compensated. For example, in Minnesota, only 31 percent of cattle claimed to be lost to wolves were verified to be lost to wolves and thus compensated (Fritts et al. 1992). Similarly, 52 percent of sheep claimed lost were verified as wolf-killed and 62 percent of turkeys claimed lost were verified and compensated. Verification is often difficult or impossible due to weather and scavengers destroying evidence, or terrain and vegetation making missing animals hard to locate. Because of a cumbersome system for verification and payment, and the lack of adequate compensation, the Damage Compensation Program Alternative would place a financial burden on farmers and ranchers as well as the administering organization.

The compensation scenario could place a financial burden on the taxpayer if based solely on general revenue sources, and on the consumer if market prices rise. If compensation payments did not adequately cover a producer's losses, the producer could go out of business. This would adversely affect the agricultural community as well as the individual producer.

F. Physical Impact Assessment

The following sections discuss the impacts of APHIS ADC program activities on the physical environment, including air, water, soil, and human health.

1. No Action Alternative

The No Action Alternative assumes that some wildlife damage control services would continue to be provided in certain situations, though the APHIS ADC program would no longer exist. One situation assumes that other Federal agencies with a mandate to protect particular resources would provide wildlife damage control services to protect those resources. It is assumed that these agencies would use the best legally available technology and follow current restrictions and regulations, just as the present APHIS ADC program does. For such activities, potential impacts on the physical environment and human health would be the same as those described for the Current Program Alternative.

Another situation under the No Action Alternative assumes that State and local agencies may choose to accept a greater role in wildlife damage control. It is assumed that these agencies would still only employ legally available methods and that the methods would be applied skillfully. However, accountability would be less uniform, because present program activities would be administered by various State and local agencies. As a result, from a national perspective, the direction and magnitude of impacts on air, water, soil, and human health could exhibit greater variability. Therefore, impacts could be higher or lower in any given location.

In the third situation, some wildlife damage control services currently provided by the APHIS ADC program would be conducted by individuals, private contractors, or organizations. The potential for impacts on the physical environment and human health would be much higher in this situation. Without APHIS ADC program supervision or assistance, the potential for improper use or inappropriate selection of control methods would increase.

Based on these situations, some wildlife damage control activities would not be conducted, resulting in no impacts on the physical environment. Some aspects of this alternative would have the same potential impacts on air, soil, water, and human health as the Current Program Alternative, while other aspects would have greater potential effects. Overall, the No Action Alternative has a greater potential for impacting the physical environment and human health than the Current Program Alternative.

2. Current Program Alternative

The current program uses a variety of control methods, which have already been described in previous sections (also see Appendix J). The use of these methods may affect air, water, soil, and human health.

a. Air

Most of the control methods employed by the APHIS ADC program have no observable impacts on air quality. Mechanical methods (e.g., leghold, quick-kill, and cage traps), aerial and ground shooting, and exclusion devices (e.g., fences or other physical barriers) do not impact air quality. Frightening devices (e.g., lights or distress calls) would have no significant impact on air quality. Air is not a preferred residence/medium of chemical methods of control. Therefore, these chemicals would not significantly impact air quality.

Methods that involve the use of explosives, such as pyrotechnics that generate noise to scare animals or binary explosives used to break up beaver dams, may cause localized impacts on air quality. Explosives may generate small amounts of carbon monoxide (CO),

carbon dioxide (CO_2), nitrogen oxide (NO_x), and sulfur dioxide (SO_2) as a result of combustion. These fumes would be produced in very localized areas and would dissipate within several feet of explosion sites. Fumigants, such as gas cartridges, also would have limited impacts on air quality. Use of gas cartridges would result in localized emissions of carbon monoxide, nitrogen oxide, phosphorus, and sulfur (Appendix P).

Certain toxicants may be released into the air as a result of their delivery method. The M-44 may release small amounts of sodium cyanide particles, which would dissipate rapidly within a few feet of the release site. The potential impacts on air quality from this control method are minimal.

For purposes of this EIS, impacts on air quality from the use of control methods currently employed in APHIS ADC program activities are considered negligible.

b. Water

Mechanical methods of control (e.g., traps and aerial shooting) and frightening devices (e.g., pyrotechnics, lights, and distress calls) would not impact surface water or groundwater quality.

Habitat modification methods (e.g., removal of beaver dams) may increase turbidity of surface waters for a short period of time. Removal of beaver dams also may result in reduced capacity for water storage and an increase in stream velocity, which may alter the stream temperature. Often the intended results of beaver dam removal are to achieve fisheries, endangered species, or other management objectives.

The explosion associated with the removal of a dam also may release nitrates into the water that potentially could leach into groundwater. However, the concentrations would be extremely low and rapidly diluted and dispersed as streamflow is restored. The introduction of some nitrates into surface water is also possible from the use of fumigants (e.g., gas cartridges) (Appendix P).

Improper use or accidental spills of chemicals used in control activities, such as toxicants and frightening (repellents) and stressing agents, could contaminate surface water. Chemicals used by the APHIS ADC program are not registered for use in or near surface water and have minimal potential for water contamination when used properly. These chemicals are not used over water; therefore, they have minimal potential for contaminating surface water. The potential for contamination of groundwater from accidental spills or improper use is even less than that for surface water contamination.

For purposes of this EIS, impacts on water quality from the use of control methods currently employed in APHIS ADC program activities are considered negligible.

c. Soil

There are no observed impacts on soils from the use of aerial or ground shooting, scaring devices (e.g., lights or distress calls), or chemical stressing agents.

A few control methods physically disturb the soil surface. For example, there is some superficial disturbance where traps are set. Barrier construction or placement also may result in some minor, localized erosion of soil surfaces.

Explosive devices used in beaver dam removal may slightly increase nitrate levels at the site of detonation. Removing a beaver dam may also increase stream discharge and velocity, which may alter stream bank erosion and sedimentation in the stream channel.

Other types of pyrotechnics, such as gas exploders and gas cartridge fumigants, if they are used improperly or if the materials are defective, have the potential to cause fires, resulting in vegetative loss, erosion, and air and water deterioration.

Chemical repellents, anticoagulants, and other toxicants may be accidentally spilled, which could lead to some soil contamination. However, any such contamination would impact only small areas and would dissipate or degrade over time.

For purposes of this EIS, impacts on soils from the use of control methods currently employed in APHIS ADC program activities are considered negligible.

d. Human Health

Some APHIS ADC control methods may pose potential hazards to employees and the public if improperly used. However, the health risk to the public is low because APHIS ADC methods are used in areas where public access is limited, or where such use poses low risk due to APHIS ADC standard operating procedures. Additionally, warning signs are posted to alert the public when such devices are present. APHIS ADC records reflect no injuries to the public during FY 1988.

Some methods pose potential hazards to APHIS ADC employees. Aerial hunting can be hazardous due to mechanical or weather problems. Leghold and quick-kill traps can cause minor injuries to hands or fingers and the removal of animals from various traps may result in animal bites or scratches. The use of firearms can result in fatalities or serious injuries if improperly used or malfunctions occur. Additionally, APHIS ADC employees are exposed to hazards normally associated with working outdoors including exposure to adverse weather conditions, exposure to animal-borne diseases, and tripping over rocks or other obstacles. However, injuries are minimized by training, experience, and regulations or policies which prescribe appropriate procedures to follow in implementing control methods.

Both APHIS ADC personnel and others could be accidentally poisoned from APHIS ADC program activities. For example, poisoning of humans and domestic animals could result from accidental exposure to an M-44 device, which dispenses sodium cyanide. The inherent risks of the use of sodium cyanide are well documented (*Federal Register* 1975; USDI 1978). However, when used in accordance with the EPA-approved label, the hazard from M-44 sodium cyanide capsules is minimal (see Appendix Q).

Appendix P provides a detailed risk assessment and documents the low levels of risk associated with methods as used by APHIS ADC personnel.

3. Nonlethal Control Program Alternative

Under the Nonlethal Control Program Alternative, only nonlethal methods would be used by APHIS ADC to prevent or reduce wildlife damage. Most control methods with the potential for negative impacts on the physical environment or human health, such as quick-kill traps, shooting, and chemical toxicants, would not be used. As discussed under the Current Program Alternative, the impacts of nonlethal methods on air, water, and soil would be negligible. The potential for APHIS ADC impacts on human health and safety would also be decreased since lethal controls would no longer be used by APHIS employees. Hazards from working in the field (e.g., exposure to severe weather and animal-borne diseases), however, would still exist as described under the Current Program Alternative.

Since other government agencies, private organizations, and individuals would likely provide wildlife damage management services no longer offered by APHIS ADC, the Nonlethal Control Program Alternative would have an overall greater potential for impacting the physical environment and human health than the Current Program Alternative to the extent that the nonlethal methods fail to be effective. These impacts were discussed under the No Action Alternative.

4. Nonlethal Before Lethal Control Program Alternative

Even though the Nonlethal Before Lethal Control Program Alternative would require APHIS ADC personnel to first use appropriate nonlethal methods to resolve problems of wildlife damage, the concept of IPM would allow lethal controls to be used if necessary. Therefore, the impacts of APHIS ADC actions on air, water, soil, and human health would be similar to those described under the Current Program Alternative. However, if lethal controls were used by individuals in some situations during the period when APHIS ADC personnel are using nonlethal methods, there could be some adverse impacts on air, water, soil, and human health. This possibility was discussed under the No Action Alternative.

5. Damage Compensation Program

The Damage Compensation Program Alternative may take one of two forms: (1) parity compensation for losses (at 100 percent of market value), or (2) partial compensation (less than full value). At parity, some agricultural producers would still implement controls to alleviate or reduce losses. At compensation levels below parity, the likelihood of control actions would increase. Additionally, wildlife damage control activities would be conducted by other agencies or individuals who incur damage to nonagricultural resources. Overall impacts on air, water, and soil could be even lower than those of the current program because fewer wildlife damage control activities would probably occur. However, where individuals conduct control activities, locally significant impacts could occur. Protection of human health and safety would continue, and the impacts would be similar to those of the current program.

G. Cumulative Impacts

Cumulative impacts, as defined by CEQ (40 CFR 1508.7), are impacts on the environment that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts may result from individually minor, but collectively significant, actions taking place over time. Analysis of potential cumulative impacts must be focused at the appropriate level of analysis. The purpose of this programmatic EIS is to evaluate the environmental impacts of alternative programs for meeting APHIS ADC's statutory responsibilities. Cumulative impacts of these **programmatic** alternatives, not of specific projects or activities carried out as a result of adoption of a program, are appropriately analyzed in this EIS. The potential for cumulative impacts for all five alternatives is described in the following sections.

1. No Action Alternative

No ADC program would be administered by APHIS under the No Action Alternative. No technical assistance, direct control, research, or funding would be provided through APHIS for wildlife damage control activities. Other Federal, State, and local agencies or individuals and private organizations probably would conduct control activities. Under this alternative, the cumulative impacts of wildlife damage control activities conducted by other agencies are not considered significant.

The conduct of wildlife damage control activities by individuals is expected to increase. The lack of coordination among individuals conducting such actions could lead to duplication of effort and possible misuse or overuse of control measures. The lack of wildlife

damage control program coordination with other State wildlife management agencies could reduce those agencies' abilities to effectively manage their resource activities. Locally significant, cumulative adverse impacts could result.

There is the potential for cumulative adverse impacts on T&E species under this alternative. Threatened and endangered species could experience losses if inappropriate control measures and techniques are applied at the local level. Those losses could result in locally significant, cumulative impacts on this sensitive species group.

2. Current Program Alternative

Under the Current Program Alternative, the APHIS ADC program would implement wildlife damage control, based on IPM, on a nationwide basis. The APHIS ADC program is the primary Federal program with wildlife damage control responsibilities, but other Federal and State agencies, counties, and municipalities also may conduct wildlife damage control activities. Through ongoing coordination with these agencies, APHIS ADC is aware of the wildlife damage control activities they may conduct. The APHIS ADC program does not normally conduct direct control concurrently with other agencies in the same area; however, cooperating agencies may specify responsibilities that call for APHIS ADC to implement similar control activities on adjacent sites. Additionally, others also may be directly involved in wildlife damage control on their land or at their facilities. For example, a rancher experiencing sheep losses to coyotes may choose to hire a private trapper to solve the damage problem rather than enter into a cooperative agreement with APHIS ADC. At the same time, the APHIS ADC program may provide similar services on adjacent ranches through cooperative agreements. The potential cumulative impacts analyzed below could occur either as a result of APHIS ADC program activities repeated over time or as a result of the aggregate effects of APHIS ADC activities combined with the activities of other agencies and individuals.

Since issuing the DEIS, APHIS ADC has re-examined the quantities of chemicals used in direct control, and has conducted a thorough analysis of the risks associated with use of these chemicals (see Appendix P). A key consideration concerning cumulative impacts is that APHIS ADC uses extremely small quantities of chemicals on a nationwide basis. This is especially borne out in comparing the quantities used by APHIS ADC on an annual basis with those used by other registrants nationwide. For example, APHIS ADC used a maximum annual quantity of one gallon of fenthion during the target years FY 1988 through 1991. During 1988, approximately 93 million gallons of organophosphate pesticides were produced in the United States (USITC 1988). During the 4-year period FY 1988 through 1991, the APHIS ADC program used no more than 220 pounds of sodium cyanide annually (Table 4-5). During 1988, approximately 160 million pounds of this compound were produced in the United States (Magar 1992). These totals provide perspective on the quantities of chemicals used in the APHIS ADC program.

The risk assessment was conducted to determine potential risks to nontarget species, APHIS ADC employees, and the public that may be associated with APHIS ADC pesticide use. The results of this assessment, presented in detail in Appendix P, indicate few risks associated with APHIS ADC chemicals when applied at rates specified on the registration labels. Where such chemical use does pose undue risks, APHIS ADC has identified appropriate mitigation measures or has stopped using the chemical of concern. In light of the risk assessment findings and mitigation measures, the likelihood of significant cumulative impacts resulting from APHIS ADC chemical use is small.

Implementation of State and Federal wildlife management plans (including T&E species recovery plans), annual game and fur harvests, road kills, poaching, and habitat loss and modification are examples of human activities that may result in mortality in specific wildlife populations. Weather, disease, predation, starvation, and intra- and interspecific competition also account for deaths in wildlife populations. Information on numbers of

animals killed as a result of APHIS ADC technical assistance is not available. This EIS recognizes that the total annual removal of individual animals from wildlife populations by all causes constitutes the cumulative mortality. Analysis of APHIS ADC program takes during FY 1988 for 17 species, in combination with other mortality, indicates that cumulative impacts are not significant.

In combination with the activities of other agencies and individuals, APHIS ADC activities could result in adverse cumulative impacts to T&E species. The USFWS Biological Opinion indicated that APHIS ADC activities could jeopardize the existence of eight species: Wyoming toad, Attwater's prairie chicken, the southwestern population of the bald eagle, black-footed ferret, San Joaquin kit fox, California condor, Mississippi sandhill crane, and the grizzly bear (Cabinet-Yaak population). As a result, the USFWS has recommended prudent and reasonable alternatives to the use of specific control methods that could adversely affect these species. APHIS ADC has adopted these reasonable and prudent alternatives as part of its mitigation measures for the current program. Accordingly, it is not anticipated that APHIS ADC activities will result in significant adverse cumulative impacts to T&E species.

Based on the diversity and distribution of the affected environments, no significant cumulative impacts are identified or expected as a function of wildlife damage control activities conducted by the present APHIS ADC program.

3. Nonlethal Control Program Alternative

APHIS personnel would not be involved in killing any wildlife under the Nonlethal Control Program Alternative, but as stated previously, it is likely that other agencies, groups, and individuals would use lethal methods to resolve wildlife damage problems. The use of various control methods by untrained individuals could have significant adverse cumulative impacts on target and nontarget wildlife and other natural resources. Threatened and endangered species particularly could be negatively affected as described under the No Action Alternative and Damage Compensation Program Alternatives.

4. Nonlethal Before Lethal Control Program Alternative

A modified IPM approach would be used with the Nonlethal Before Lethal Control Program Alternative with the stipulation that nonlethal controls would be used before lethal controls in dealing with wildlife damage. The cumulative impacts of this alternative would not be significant as described under the Current Program Alternative.

5. Damage Compensation Program

The implementation of a compensation program would result in a redirection of APHIS ADC program activities toward verification and compensation for crop or livestock losses only. A compensation program would avoid the killing of wildlife by APHIS ADC personnel. Two levels of compensation are considered under this alternative: (1) parity compensation, which would compensate the producer at full market value for losses; and (2) partial compensation, which would compensate the producer at a percentage of full market value for losses. At either level, but particularly at the partial compensation level, farmers or producers probably would not rely solely on compensation payments and might implement their own wildlife damage control measures. Additionally, other government agencies or individuals would likely implement wildlife damage control actions for the protection of nonagricultural resources.

Under the Damage Compensation Program, as with the other alternatives, use of various damage control methods by untrained individuals could have significant adverse cumulative impacts on target and nontarget wildlife. In particular, the indiscriminate use of toxicants by untrained individuals has the potential to kill a wide range of wildlife species. Significant cumulative impacts on the abundance and diversity of various affected species, especially T&E species, could result from this action.

H. Unavoidable Adverse Environmental Impacts

Some unavoidable adverse environmental impacts are likely to occur from the implementation of any of the proposed program alternatives. Mitigation efforts may alleviate or reduce some of the impact severity. The following sections summarize the possible adverse impacts of each alternative analyzed in detail in this EIS. The descriptions of unavoidable and adverse impacts include only those impacts that could reasonably be expected to occur under the implementation of the No Action Alternative, Current Program Alternative, Nonlethal Control Program Alternative, Nonlethal Before Lethal Control Program Alternative, and Damage Compensation Program Alternatives.

1. No Action Alternative

Under the No Action Alternative, no wildlife damage control actions would be taken by the APHIS ADC program. Under this alternative, it is assumed that other Federal, State, or local agencies would choose to assume some responsibility for activities of the present APHIS ADC program. In addition, individuals would carry out some wildlife damage control measures independent of Federal, State, or local agency actions.

a. Biological Impacts

There would be local adverse impacts on target wildlife species where lethal methods of wildlife damage control are implemented by Federal, State, or local agencies or individuals. Many individual animals would be killed each year, and local populations would be purposely reduced. When individuals conduct control activities, there would be reduced documentation of the numbers of animals killed. The level of unavoidable adverse impacts would potentially increase under this alternative. T&E species may be both adversely and positively affected by the alternative.

b. Economic Impacts

There would be adverse impacts on producers who choose to pay the costs of implementing wildlife damage controls, producers and owners who suffer losses that could be reduced or eliminated by an APHIS ADC program, and consumers who pay higher prices for goods as a result of increased producer losses or costs for wildlife damage control.

c. Sociocultural Impacts

There would be adverse impacts on persons and groups who would not favor elimination of all wildlife damage control as practiced by APHIS ADC, animal welfare groups that generally would not favor eliminating all wildlife management practices, animal rights groups that would oppose implementation of wildlife damage controls by individuals, and producers who generally would disapprove of losing APHIS ADC assistance. Because there would be less uniform oversight and coordination of wildlife damage management, the practices that are opposed by animal rights groups probably would be more prevalent. Some agricultural communities that perceive an wildlife damage control program to be critical to their livelihood would suffer both economic and social impacts.

d. Physical Impacts

There would be greater potential for unavoidable adverse impacts from damage control conducted by individuals.

2. Current Program Alternative

The Current Program Alternative is the existing APHIS ADC program as described in this EIS.

a. Biological Impacts

There will be local adverse impacts on wildlife species where lethal damage methods are used. Many individual animals will be killed each year, and local populations will be purposely reduced.

b. Economic Impacts

The FY 1988 program cost to Federal taxpayers was approximately $25 million. In addition, costs to cooperators totaled $13 million. Despite effective program efforts to minimize losses from wildlife damage, there are still enormous losses that are not being avoided.

c. Sociocultural Impacts

There will be adverse impacts on the feelings of persons and organizations that consider chemical or lethal control methods inhumane or unnecessary.

d. Physical Impacts

There are no known unavoidable adverse impacts.

3. Nonlethal Control Program Alternative

APHIS personnel would not be involved in killing any wildlife to prevent damage under the Nonlethal Control Program Alternative, but other agencies, organizations, and individuals would likely use lethal controls to resolve wildlife damage and to minimize wildlife threats to human health and safety.

a. Biological Impacts

The lack of applicable and effective nonlethal methods for many damage situations would likely result in the continued use of lethal methods by producers experiencing damage and by other agencies and groups. This could result in local adverse impacts on wildlife species. Some control actions practiced by untrained individuals could cause significant negative impacts on target and nontarget local wildlife populations, particularly threatened or endangered species.

b. Economic Impacts

It is likely that more requests for assistance could be initially addressed under this alternative because technical assistance rather than the often more costly direct control would be used to handle problems. As with the Current Program Alternative, taxpayers would be required to financially support the APHIS ADC program. Taxpayers might be adversely

impacted with this alternative by having to support both a nonlethal program in APHIS in addition to other Federal or State programs required to keep wildlife damage at an acceptable level.

Cooperative funding could be expected to decrease because some producers would be less likely to pay for services they could perform themselves or for assistance that would be less effective than that provided through the present APHIS ADC program. There would also be a reduction in cooperative programs with other Federal and State agencies and organizations. With decreased cooperative funding, fewer cooperative employees would be retained.

Producers suffering from wildlife damage would be adversely impacted by APHIS having to use only nonlethal methods which often are ineffective in stopping or reducing damage. Consumers may be obliged to pay higher prices for commodities impacted by wildlife damage.

c. Sociocultural Impacts

Some producers might be forced to leave production agriculture as a result of APHIS not being able to use lethal controls to resolve wildlife damage. Many others might have their lives impacted by higher depredation losses as a result of fragmented, variable approaches to wildlife damage control by other agencies or by their inability to reduce the level of damage. Other individuals who favor a coordinated Federal IPM program to manage wildlife damage would disapprove of a totally nonlethal approach.

The control practices most opposed by animal rights interests would likely become more prevalent.

Hazards to public health and safety resulting from the presence or actions of wildlife would generally increase without a comprehensive, coordinated Federal program. Other Federal and State agencies involved with public health and safety issues would likely vary in their approach and delivery of wildlife damage management programs. Where wildlife-related threats to human health and safety are involved, the public will likely demand a level of lethal control necessary to prevent injury or loss of human life.

d. Physical Impacts

There would be greater potential for unavoidable adverse impacts from damage control conducted by individuals.

4. Nonlethal Before Lethal Control Program Alternative

In the Nonlethal Before Lethal Control Program Alternative, a modified IPM approach would be used to resolve wildlife damage, but nonlethal methods would have to be used first. This alternative would constrain ADC specialists to use nonlethal methods during the initial phase of providing control assistance, regardless of whether their professional experience indicated nonlethal methods would be effective.

a. Biological Impacts

The administrative constraint of using nonlethal methods first could lead to increased loss of crops and livestock, damage to structures and facilities, and threats to public health and safety because nonlethal methods are not always successful in preventing or reducing wildlife damage. Wildlife damage could be expected to continue over a longer period of time while nonlethal control is attempted. In damage situations where nonlethal methods

alone prove to be ineffective, or when time and cost make nonlethal methods impracticable, the magnitude of loss could be expected to increase in comparison with that expected under the Current Program Alternative.

There would be local adverse impacts on wildlife populations where lethal methods are used resulting in the death of animals and the purposeful reduction of local populations.

b. Economic Impacts

With this alternative, there may be some decrease in cooperative funding as producers experience increased losses while nonlethal methods were being employed and decide to direct their resources to more effective methods. Ultimately, more program resources would be used on nonlethal controls thus limiting APHIS ADC from timely implementation of potentially more effective lethal methods. Under the existing level of funding, fewer problems would be resolved, and program efficiency and effectiveness would decline due to the longer interval of time and greater commitment of personnel to bring a problem to resolution. Additionally, increased staff time would be required for more demanding monitoring and record keeping for site-specific projects.

Taxpayers would pay for the APHIS ADC Program. A larger proportion of available funds would be expended to implement nonlethal methods and to conduct nonlethal methods research than with the Current Program Alternative. With nonlethal methods being used before lethal methods, the level of economic loss might be higher than with the Current Program Alternative. Despite the use of a modified IPM approach, significant levels of wildlife damage would continue to occur and possibly increase across the country.

Under this alternative, additional funding would be necessary to cover the cost of increased administrative and operational requirements to keep a level of effectiveness similar to that of the present ADC program.

c. Sociocultural Impacts

Levels of frustration among producers suffering damage from wildlife would likely increase with the requirement that nonlethal methods be used before lethal methods. Some groups and individuals who oppose the use of lethal methods would be unhappy with the Nonlethal Before Lethal Control Program Alternative.

Serious threats to public health and safety such as wildlife hazards at airports could increase while attempts were made to use nonlethal control.

d. Physical Impacts

The physical impacts under this alternative are assumed to be similar to those under the Current Program Alternative. The significance of impacts would depend on the type and extent of actions occurring as the result of individuals implementing wildlife damage controls.

5. Damage Compensation Program

The Damage Compensation Program Alternative is considered at two levels: (1) parity compensation, which would compensate the producer at full market value for losses; and (2) partial compensation, which would compensate the producer at a percentage of the full market value for losses. The distinction between the two levels of compensation is important to the assessment of the potential environmental impacts.

a. Biological Impacts

Even at full parity compensation, control of nonagricultural wildlife damage would be necessary, and there would be local adverse impacts on target wildlife species where lethal methods of control are used. Many individual animals would be killed, and some local populations would be purposely reduced. At partial compensation, additional adverse impacts on target wildlife would be expected from individuals implementing their own wildlife damage controls.

b. Economic Impacts

There would be adverse impacts on taxpayers because of the costs of implementation and administration at either parity or partial compensation levels. The Damage Compensation Program Alternative would be more expensive to implement at the parity level, and losses from wildlife damage would be higher than under the current program. Therefore, taxpayers, consumers, and producers would experience unavoidable adverse impacts.

c. Sociocultural Impacts

There would be adverse impacts on those who would not favor eliminating wildlife damage control as practiced by APHIS. In addition, environmental, animal welfare, and animal rights groups, as well as others, would be adversely impacted by uncoordinated lethal damage control actions conducted by individuals.

d. Physical Impacts

The physical impacts under this alternative are assumed to be similar to those under the Current Program Alternative. The significance of impacts would depend on the type and extent of actions occurring as the result of individuals implementing wildlife damage controls.

I. Irreversible and Irretrievable Commitment of Resources

The criteria for implementing NEPA require that any irreversible and irretrievable commitment of resources by a proposed program alternative be included within the EIS. The APHIS guidelines for NEPA also require that irreversible effects on basic resources be considered in making environmental assessments. Because the APHIS ADC program deals with wildlife, a renewable resource, the effects of the program are not irreversible or irretrievable. Because no construction or other major commitment of resources is part of the program, the use of fossil fuels is the only irreversible or irretrievable commitment of resources by the APHIS ADC program or the alternatives.

1. No Action Alternative

Under the No Action Alternative (no APHIS ADC program) no fossil fuels or electrical energy would be used by APHIS ADC for wildlife damage control activities. However, damage control operations by other governmental agencies or individuals could consume similar amounts of energy.

2. Current Program Alternative

Estimates for FY 1988 indicated that 493,918 gallons of unleaded gasoline and diesel fuel were used by APHIS ADC program vehicles performing program activities. An additional 55,261 gallons of aviation fuel were used in aerial hunting operations. An undetermined amount of electrical energy (some of which came from fossil fuels) was expended for office maintenance.

Based on these estimates, the present APHIS ADC program produces negligible impacts on the national supply of fossil fuels and electrical energy.

3. Nonlethal Control Program Alternative

Only aerial harassment would occur under the Nonlethal Control Program Alternative. Other vehicle fuel consumption might increase over that in the present APHIS ADC program if nonlethal methods were ineffective or not as effective. Additional uses of fossil fuel and electrical energy would be similar to those of the Current Program Alternative.

4. Nonlethal Before Lethal Control Program Alternative

Use of fossil fuels and electrical energy under the Nonlethal Before Lethal Control Program Alternative would be similar to that described under the Current Program Alternative. A comparatively small increase in gasoline usage associated with increased travel to implement mandatory nonlethal strategies prior to initiating lethal controls would likely be offset by reduced cooperative operational projects and associated travel.

5. Damage Compensation Program

Under this alternative gasoline or diesel fuel would be consumed for verification and compensation activities. No consumption of aviation fuel by APHIS ADC employees would occur from aerial hunting activities, because these activities would be discontinued. It is possible that more fuel would be used by APHIS ADC personnel under a compensation program because of extensive travel related to loss claim verification activities.

J. Comparison of Impacts of the Alternatives

The comparison of impacts of the alternatives (Table 4-42) presents a summary of the observed and reported impacts of the present APHIS ADC program derived from the analysis in this chapter. Adverse impacts of implementing other alternatives probably would be similar to or exceed those for the Current Program Alternative. The analyses are based on professional judgment, previous experience, and a limited number of examples of actions and results of no action, nonlethal and compensation programs described in the literature. The impacts presented in the table represent what are considered reasonable outcomes based on the alternatives and conditions as described in this EIS. The comparison of impacts (Table 4-42) is not intended to suggest that other outcomes are not possible. In fact, there may be an infinite number of possible outcomes for these alternatives.

As stated in Chapter 2, other alternatives were evaluated as viable decision options, but were not presented in detail in this EIS because their environmental impacts would be similar to the five alternatives presented in detail. Table 4-43 compares the impacts of the alternatives not presented in detail.

Table 4-42

Comparison of Impacts of Alternatives Considered in Detail in This EIS

Impact	No Action Alternative	Current Proram Alternative [a]	Nonlethal Control Program Alternative	Nonlethal Before Lethal Control Program Alternative	Damage Compensation Program Alternative [b]
BIOLOGICAL IMPACTS					
On Local Wildlife Species Diversity	Potential for significant adverse impact.	No significant impact.	Potential for significant adverse impact.	Potential for significant adverse impact.	Potential for significant adverse impact.
On Abundance of:					
Target Species					
Impacts of National or State Importance	No significant impact.	No significant impact.	No significant impact.	No significant impact.	No significant impact.
Local Impacts	Potential for significant adverse impact.	Potential for significant adverse impact.	Potential for significant adverse impact.	Potential for significant adverse impact.	Potential for significant adverse impact. Adverse impact likely to be greater at partial compensation levels.
Nontarget Species					
Impacts of National or State Importance	No significant impact.	No significant impact.	No significant impact.	No significant impact.	No significant impact.
Local Impacts	Potential for significant adverse impact.	Potential for significant adverse and beneficial impacts.	Potential for significant adverse impact.	Potential for significant adverse and beneficial impacts.	Potential for significant adverse impact.
Threatened and Endangered Species [c]					
Impacts of National or State Importance	Potential for significant beneficial impact from Federal, state, or local agency actions. Potential for significant adverse impact from the actions of individuals.	Significant beneficial impact. USFWS Section 7 Consultation identifies "reasonable and prudent alternatives" to ensure significant adverse impact will not occur.	Potential for significant beneficial and adverse impacts. Potential for significant adverse impact from actions of individuals.	Potential for significant beneficial and adverse impacts. Potential for significant adverse impact from actions of individuals.	Potential for significant beneficial and adverse impacts. Adverse impact more likely from the actions of individuals at partial compensation. No provision for APHIS ADC to protect T&E species.
SOCIOCULTURAL IMPACTS [d]					
Ecological Interest Group	Generally would not favor eliminating APHIS ADC program activities. Generally would not favor an increase of uncoordinated damage control actions by individuals.	Generally do not oppose wildlife damage control concepts. May not approve of all APHIS ADC program activities.	Generally would approve of a nonlethal program. Generally would not favor an increase of uncoordinated damage control actions by individuals.	Generally would approve of a nonlethal before lethal control program. May not approve of all APHIS ADC program activities.	Generally would not favor a compensation program in lieu of APHIS ADC program activities. Generally would not favor an increase of uncoordinated damage control actions by individuals.

(Continued)

Table 4-42 (Continued)

Comparison of Impacts of Alternatives Considered in Detail in This EIS

Impact	No Action Alternative	Current Proram Alternative [a]	Nonlethal Control Program Alternative	Nonlethal Before Lethal Control Program Alternative	Damage Compensation Program Alternative [b]
Animal Welfare	Generally would not favor eliminating APHIS ADC control methods considered humane. Generally would not favor an increase of wildlife control actions by individuals.	Generally do not oppose wildlife damage control concepts. Generally disapprove of APHIS ADC methods considered inhumane.	Would approve of a nonlethal program.	Generally do not oppose wildlife damage control concepts. Generally disapprove of APHIS ADC methods considered inhumane.	Generally would not favor compensation in lieu of eliminating APHIS ADC control methods considered humane. Generally would not favor an increase of uncoordinated damage control actions by individuals.
Animal Rightists	Would favor eliminating the APHIS ADC program. Would favor eliminating most wildlife damage control activities.	Generally disapprove of most wildlife damage control concepts. Generally disapprove of APHIS ADC program activities.	Generally disapprove of most wildlife damage control concepts. Generally would favor nonlethal over lethal methods.	Generally disapprove of most APHIS ADC activities. Generally disapprove of most wildlife damage control concepts.	Would favor compensation in lieu of wildlife damage control activities.
ADC Service Recipients	Generally would disapprove of losing APHIS ADC assistance. Potential for increased stress and loss of agricultural community viability.	Generally approve of current APHIS ADC program practices.	Generally would approve of nonlethal methods as long as they are effective. May conduct lethal controls on their own. Potential for increased agricultural losses and increased stress.	Generally approve of most methods used by the APHIS ADC program. May conduct lethal controls on their own. Potential for increased agricultural losses and increased stress.	Generally would favor parity compensation for wildlife damage. Generally would favor partial compensation for wildlife damage but would not favor loss of APHIS ADC program activities.
General Public	Generally would be unaware of impact of No Action Alternative.	Generally unaware of APHIS ADC program practices.	Generally would be unaware of impact of Nonlethal Control Program Alternative.	Generally would be unaware of impact of Nonlethal Before Lethal Control Program Alternative.	Generally would be unaware of impact of Compensation Program Alternative.
ECONOMIC IMPACTS					
Direct Impacts on Affected Parties					
Agricultural Losses Avoided or Risks Reduced	Significantly smaller impact than the Current Program Alternative is likely.	Relatively large impact compared to the other alternatives.	Smaller impact than the Current Program Alternative is likely.	Smaller impact than the Current Program Alternative is likely.	No impact, other than compensation of verified losses.
Non-Agricultural Losses Avoided or Risks Reduced	Significantly smaller impact than the Current Program Alternative is likely.	Relatively large impact compared to the other alternatives.	Smaller impact than the Current Program Alternative is likely.	Smaller impact than the Current Program Alternative is likely.	Impacts from non-APHIS ADC activities only.

(Continued)

Table 4-42 (Continued)

Comparison of Impacts of Alternatives Considered in Detail in This EIS

Impact	No Action Alternative	Current Proram Alternative [a]	Nonlethal Control Program Alternative	Nonlethal Before Lethal Control Program Alternative	Damage Compensation Program Alternative [b]
Damage Control Expenditures	Small or large, depending on role of the public sector.	Relatively small impact compared to the other alternatives.	Larger impact than the Current Program Alternative is likely.	Larger impact than the Current Program Alternative is likely.	Small or large, depending on role of the public sector.
Indirect impacts on Affected Parties					
Agricultural Losses Avoided or Risks Reduced for Third Parties	Significantly smaller impact than the Current Program Alternative is likely.	Relatively large impact compared to the other alternatives.	Significantly smaller impact than the Current Program Alternative is likely.	Smaller impact than the Current Program Alternative is likely.	Significantly smaller impact than the Current Program Alternative is likely.
Non-Agriculural Losses Avoided or Risks Reduced for Third Parties	Significantly smaller impact than the Current Program Alternative is likely.	Relatively large impact compared to the other alternatives.	Significantly smaller impact than the Current Program Alternative is likely.	Smaller impact than the Current Program Alternative is likely.	Impacts from non-APHIS ADC activities only.
Positive Contribution to the Local Economy	Significantly smaller impact than the Current Program Alternative is likely.	Relatively large impact compared to the other alternatives.	Smaller impact than the Current Program Alternative is likely.	Smaller impact than the Current Program Alternative is likely.	Smaller impact than the Current Program Alternative is likely.
Direct Public Impacts					
APHIS ADC Program Expenditures	None	Relatively small impact compared to the other alternatives.	Larger impact than the Current Program Alternative is likely.	Larger impact than the Current Program Alternative is likely.	Significantly larger impact than the Current Program Alternative is likely.
Potentially Harmful Environmental Effects	Significantly larger impact than the Current Program Alternative is likely.	Relatively small impact compared to the other alternatives.	Larger impact than the Current Program Alternative is likely.	Larger impact than the Current Program Alternative is likely.	Significantly larger impact than the Current Program Alternative is likely.
Indirect Public Impacts					
Non-APHIS ADC Program Expenditures	Large or small depending on role of the public sector, and public liability.	Relatively small impact compared to the other alternatives.	Larger impact than the Current Program Alternative is likely.	Larger impact than the Current Program Alternative is likely.	Large or small depending on role of the public sector, and public liability.
PHYSICAL IMPACTS					
Air					
Impacts of National or State Importance	No significant impact.	No significant impact.	No significant impact.	No significant impact.	No significant impact.
Local Impacts	No significant impact.	No significant impact.	No significant impact.	No significant impact.	No significant impact.

(Continued)

Table 4-42 (Continued)

Comparison of Impacts of Alternatives Considered in Detail in This EIS

Impact	No Action Alternative	Current Proram Alternative [a]	Nonlethal Control Program Alternative	Nonlethal Before Lethal Control Program Alternative	Damage Compensation Program Alternative [b]
Water (Surface and Groundwater)					
Impacts of National or State Importance	No significant impact.	No significant impact.	No significant impact.	No significant impact.	No significant impact.
Local Impacts	No significant impact.	No significant impact.	No significant impact.	No significant impact.	No significant impact.
Soil					
Impacts of National or State Importance	No significant impact.	No significant impact.	No significant impact.	No significant impact.	No significant impact.
Local Impacts	No significant impact.	No significant impact.	No significant impact.	No significant impact.	No significant impact.
Hazards to Humans	Potential for significant adverse impact to the general public and to individuals implementing wildlife damage controls.	Potential for localized and infrequent adverse impact to the general public and to individuals implementing wildlife damage controls.	Potential for significant adverse impact to the general public and to individuals implementing wildlife damage controls.	Potential for significant adverse impact to the general public and to individuals implementing wildlife damage controls.	Potential for significant adverse impact to the general public and to individuals implementing wildlife damage controls.

[a] Impacts under the Current Program Alternative are based on information for FY 1988 as a representative, "snapshot" year for the APHIS ADC program.

[b] Compensation would be provided by APHIS for losses to agricultural crops and livestock only.

[c] Threatened and endangered species can be target or nontarget species under certain conditions or can be protected by the program. An effect on a threatened or endangered species is considered of national importance.

[d] Issues and viewpoints expressed by various sociocultural groups are presented.

Table 4-43

Comparision of Impacts of Alternatives Not Presented in Detail in This EIS

Potential Impact	Modification of Current Program Alternative to Direct Control Only, With Supporting Research Alternative	Modification of Current Program Alternative to Technical Assistance Only, With Supporting Research Alternative	Conversion of Direct Control to Education and Technical Assistance With Transfer of All Funds and Responsibility to USDA Extension Service Alternative	Reduction of Federal Manpower and Transfer of Federal Control Operations to Private Contractors Alternative	Transfer of Present Program, Including Funds, to State Wildlife Management Agencies Alternative
BIOLOGICAL IMPACTS					
On Wildlife Species Diversity	No significant impact.	Potential for significant adverse impact from uncoordinated damage control actions by individuals.	Potential for significant adverse impact from uncoordinated damage control actions by individuals.	No significant impact.	No significant impact.
On Abundance of:					
Target Species					
Impacts of National or State Importance	No significant impact.	No significant impact.	No significant impact.	No significant impact.	No significant impact.
Local Impacts	Potential for significant adverse impact.	Potential for significant adverse impact.	Potential for significant adverse impact.	Potential for significant adverse impact.	Potential for significant adverse impact.
Nontarget Species					
Impacts of National or State Importance	No significant impact.	No significant impact.	No significant impact.	No significant impact.	No significant impact
Local Impacts	Potential for significant adverse and beneficial impacts.	Potential for significant adverse impact.	Potential for significant adverse impact.	Potential for significant adverse and beneficial impacts.	Potential for significant adverse and beneficial impacts.
Threatened and Endangered Species [a]					
Impacts of National or State Importance	Significant beneficial impact. USFWS Section 7 Consultation identifies "reasonable and prudent alternatives" to ensure significant adverse impact will not occur.	Potential for significant beneficial impact from Federal, state, or local agency actions. Potential for significant adverse impact from the actions of individuals.	Potential for significant beneficial impact from Federal, state, or local agency actions. Potential for significant adverse impact from the actions of individuals.	Significant beneficial impact. USFWS Section 7 Consultation identifies "reasonable and prudent alternatives" to ensure significant adverse impact will not occur.	Significant beneficial impact. USFWS Section 7 Consultation identifies "reasonable and prudent alternatives" to ensure significant adverse impact will not occur.
SOCIOCULTURAL IMPACTS [b]					
Ecological Interest Groups	Generally do not oppose wildlife damage control concepts. May not approve of all APHIS ADC program activities.	Generally would not favor eliminating APHIS ADC program activities. Generally would not favor an increase of uncoordinated damage control actions by individuals.	Generally would not favor eliminating APHIS ADC program activities. Generally would not favor an increase of uncoordinated damage control actions by individuals.	Generally do not oppose wildlife damage control concepts. May not approve of all program activities.	Generally do not oppose wildlife damage control concepts. May not approve of all program activities

(Continued)

Table 4-43 (Continued)

Comparision of Impacts of Alternatives Not Presented in Detail in This EIS

Potential Impact	Modification of Current Program Alternative to Direct Control Only, With Supporting Research Alternative	Modification of Current Program Alternative to Technical Assistance Only, With Supporting Research Alternative	Conversion of Direct Control to Education or Technical Assistance With Transfer of All Funds and Responsibility to USDA Extension Service Alternative	Reduction of Federal Manpower and Transfer of Federal Control Operations to Private Contractors Alternative	Transfer of Present Program, including funds, to State Wildlife Management Agencies Alternative
Animal Welfare	Generally do not oppose wildlife damage control concepts. Generally disapprove of methods considered inhumane.	Generally would not favor eliminating control methods considered humane. Generally would not favor an increase of wildlife control actions by individuals.	Generally would not favor eliminating control methods considered humane. Generally would not favor an increase of wildlife control actions by individuals.	Generally do not oppose wildlife damage control concepts. Generally disapprove of methods considered inhumane.	Generally do not oppose wildlife damage control concepts. Generally disapprove of methods considered inhumane.
Animal Rightists	Generally disapprove of most wildlife damage control concepts. Would favor eliminating most wildlife damage control activities.	Would favor eliminating the APHIS ADC program. Would favor eliminating most wildlife damage control activities.	Would favor eliminating the APHIS ADC program. Would favor eliminating most wildlife damage control activities.	Generally disapprove of most wildlife damage control concepts. Generally disapprove of wildlife damage control activities.	Generally disapprove of most wildlife damage control concepts. Generally disapprove of wildlife damage control activities.
ADC Service Recipients	Generally approve of current APHIS ADC program practices. Would disapprove of losing APHIS ADC technical assistance.	Generally would disapprove of losing APHIS ADC assistance. Potential for increased stress and loss of agricultural community viability.	Generally would disapprove of losing APHIS ADC assistance. Potential for increased stress and loss of agricultural community viability.	Generally approve of animal damage control practices.	Generally approve of animal damage control practices.
General Public	Generally unaware of APHIS ADC program practices.	Generally would be unaware of impact of this alternative.	Generally would be unaware of impact of this alternative.	Generally unaware of animal damage control programs.	Generally unaware of animal damage control programs.
ECONOMIC IMPACTS					
Direct Impacts on Affected Parties					
Agricultural Losses Avoided or Risks Reduced	Relatively large impact compared to the other alternatives.	Significantly smaller impact than the Current Program Alternative is likely.	Significantly smaller impact than the Current Program Alternative is likely.	Relatively large impact compared to the other alternatives.	Relatively large impact compared to the other alternatives.
Non-Agriculural Losses Avoided or Risks Reduced	Relatively large impact compared to the other alternatives.	Significantly smaller impact than the Current Program Alternative is likely.	Significantly smaller impact than the Current Program Alternative is likely.	Relatively large impact compared to the other alternatives.	Relatively large impact compared to the other alternatives.

(Continued)

Table 4-43 (Continued)

Comparision of Impacts of Alternatives Not Presented in Detail in This EIS

Potential Impact	Modification of Current Program Alternative to Direct Control Only, With Supporting Research Alternative	Modification of Current Program Alternative to Technical Assistance Only, With Supporting Research Alternative	Conversion of Direct Control to Education or Technical Assistance With Transfer of All Funds and Responsibility to USDA Extension Service Alternative	Reduction of Federal Manpower and Transfer of Federal Control Operations to Private Contractors Alternative	Transfer of Present Program, including funds, to State Wildlife Management Agencies Alternative
Damage Control Expenditures	Relatively small impact compared to the other alternatives.	Small or large, depending on role of the public sector.	Small or large, depending on role of the public sector.	Relatively small impact compared to the other alternatives.	Relatively small impact compared to the other alternatives.
Indirect impacts on Affected Parties					
Agricultural Losses Avoided or Risks Reduced for Third Parties	Relatively large impact compared to the other alternatives.	Significantly smaller impact than the Current Program Alternative is likely.	Significantly smaller impact than the Current Program Alternative is likely.	Relatively large impact compared to the other alternatives.	Relatively large impact compared to the other alternatives.
Non-Agricultural Losses Avoided or Risks Reduced for Third Parties	Relatively large impact compared to the other alternatives.	Significantly smaller impact than the Current Program Alternative is likely.	Significantly smaller impact than the Current Program Alternative is likely.	Relatively large impact compared to the other alternatives.	Relatively large impact compared to the other alternatives.
Positive Contribution to the Local Economy	Relatively large impact compared to the other alternatives.	Significantly smaller impact than the Current Program Alternative is likely.	Significantly smaller impact than the Current Program Alternative is likely.	Relatively large impact compared to the other alternatives.	Relatively large impact compared to the other alternatives.
Direct Public Impacts					
APHIS ADC Program Expenditures	Relatively small impact compared to the other alternatives.	None	None	Relatively small impact compared to the other alternatives.	None.
Potentially Harmful Environmental Effects	Relatively small impact compared to the other alternatives.	Significantly larger impact than the Current Program Alternative is likely.	Significantly larger impact than the Current Program Alternative is likely.	Relatively small impact compared to the other alternatives.	Relatively small impact compared to the other alternatives.
Indirect Public Impacts					
Non-APHIS ADC Program Expenditures	Relatively small impact compared to the other alternatives.	Large or small depending on role of the public sector, and public liability.	Large or small depending on role of the public sector, and public liability.	Relatively small impact compared to the other alternatives.	Relatively small impact compared to the other alternatives.

(Continued)

Table 4-43 (Continued)

Comparision of Impacts of Alternatives Not Presented in Detail in This EIS

Potential Impact	Modification of Current Program Alternative to Direct Control Only, With Supporting Research Alternative	Modification of Current Program Alternative to Technical Assistance Only, With Supporting Research Alternative	Conversion of Direct Control to Education or Techical Assis- tance With Transfer of All Funds and Responsibility to USDA Extension Service Alternative	Reduction of Federal Manpower and Transfer of Federal Control Operations to Private Contractors Alternative	Transfer of Present Program, including funds, to State Wildlife Management Agencies Alternative
PHYSICAL IMPACTS					
Air					
Impacts of National or State Importance	No significant impact.	No significant impact.	No significant impact.	No significant impact.	No significant impact.
Local Impacts	No significant impact.	No significant impact.	No significant impact.	No significant impact.	No significant impact.
Water (Surface and Groundwater)					
Impacts of National or State Importance	No significant impact.	No significant impact.	No significant impact.	No significant impact.	No significant impact.
Local Impacts	No significant impact.	No significant impact.	No significant impact.	No significant impact.	No significant impact.
Soil					
Impacts of National or State Importance	No significant impact.	No significant impact.	No significant impact.	No significant impact.	No significant impact.
Local Impacts	No significant impact.	No significant impact.	No significant impact.	No significant impact.	No significant impact.
Hazards to Humans	Potential for localized and infrequent adverse impact to the general public and to individuals implementing wildlife damage controls.	Potential for significant adverse impact to the general public and to individuals implementing wildlife damage controls.	Potential for significant adverse impact to the general public and to individuals implementing wildlife damage controls.	Potential for localized and infrequent adverse impact to the general public and to individuals implementing wildlife damage controls.	Potential for localized and infrequent adverse impact to the general public and to individuals implementing wildlife damage controls.

[a] Threatened and endangered species can be target or nontarget species under certain conditions or can be protected by the program. An effect on a threatened or endangered species is considered of national importance.

[b] Issues and viewpoints expressed by various sociocultural groups are presented.

Chapter 5

Mitigation Measures

Chapter 5: Mitigation Measures

Discusses mitigation measures that potentially reduce impacts. These include:

- Standard operating procedures currently used in the APHIS ADC program.
- Mitigation measures.
- Monitoring and evaluation.

Chapter 5

Mitigation Measures

Table of Contents

Photo #17

The use of electrified fencing is one approach encouraged by the current ADC program that may prevent or reduce wildlife damage.

A. Introduction

Mitigation measures are any features of an action that serve to prevent, reduce, minimize, or compensate for impacts that otherwise might result from that action. The present Animal and Plant Health Inspection Service (APHIS) Animal Damage Control (ADC) program uses many such mitigation measures. The analysis of environmental impacts in Chapter 4 assumes that mitigation measures already incorporated in APHIS ADC standard operating procedures (SOPs) are followed. Some additional potential mitigation measures such as establishing minimal husbandry standards as a prerequisite to receiving ADC services and requiring traps and foot-snares to be checked daily, were suggested in public and agency comments (Appendix L). Others have been developed in response to the risk assessment (Appendix P) or the U.S. Department of Interior, Fish and Wildlife Service (USFWS) Biological Opinion (Appendix F). APHIS ADC will implement measures designed to strengthen program effectiveness through improved data collection and dissemination. Although SOPs are not mitigations as defined by the Council on Environmental Quality, they are mitigations that have been developed over years of experience and their implementation allows for improved evaluation of program effectiveness and minimized environmental impacts. APHIS ADC's standard operating procedures, additional mitigation measures, and program evaluation procedures are described below.

B. No Action Alternative

1. Potential Adverse Impacts of the No Action Alternative

Potential adverse impacts could include possible abuse or over use of control methods. In addition, there will be increased economic costs resulting from increased damage to livestock and property, and potentially higher insurance and health care costs (see Chapter 4, pp. 4-124 to 4-127).

2. Potential Mitigation for the No Action Alternative

Under the No Action Alternative the APHIS ADC program could provide no mitigation because no APHIS effort or funds would be allocated to wildlife damage control.

C. Current Program Alternative

1. Standard Operating Procedures Currently Used by the APHIS ADC Program

As a result of experience gained over many years, the APHIS ADC program has incorporated a variety of mitigation measures into its SOPs. Most of these measures have been included in the Animal Damage Control *Directives*, which provide guidance for all APHIS ADC operations and activities. The most important components are summarized below, with some examples provided. The APHIS ADC program complies with all applicable Federal, State, and local laws and regulations. These include but are not limited to the National Environmental Policy Act (NEPA); the Endangered Species Act (ESA); the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA); and State wildlife laws and regulations. A more comprehensive list of laws and regulations requiring program compliance is provided in Chapter 1.

The APHIS ADC program routinely consults with the USFWS, Federal land management agencies, and other appropriate agencies regarding program impacts. Frequent contact is made with the Bureau of Land Management (BLM) and the U.S. Department of Agriculture (USDA) Forest Service (FS) when APHIS ADC is conducting control activities on public lands managed by these agencies. BLM and USDA FS, cooperating agencies in

this final Environmental Impact Statement (EIS), as well as the grazing permittees, are interested in the levels of livestock losses to predators and the damage control methodologies used to stop or limit losses. The APHIS ADC program maintains close coordination with State wildlife or natural resource management agencies that have authority over wildlife species causing damage. APHIS ADC invites State agencies to planning meetings; conversely, State wildlife management boards often invite APHIS ADC personnel to participate in meetings convened to set wildlife harvest seasons and limits.

The APHIS ADC program is conducted under Memoranda of Understanding (MOUs) with Federal and State agencies. National MOUs with the BLM and FS delineate expectations for control activities on public lands managed by these agencies. APHIS ADC State Directors also develop subsidiary agreements at the State level with public land management and other agencies to define parameters for wildlife damage control activities. Annual work plans are negotiated with BLM districts and National Forests. These work plans detail the planned activity target species, allotments, and various other constraints. MOUs also are in effect with the Federal Aviation Administration (FAA), USDA Extension Service (ES), and many State governmental agencies. These documents outline the various responsibilities of each agency for cooperation in wildlife damage control efforts.

As part of the ongoing mitigation measures implemented for the APHIS ADC program, APHIS has established a National Animal Damage Control Advisory Committee for the purpose of providing advice to the Secretary of Agriculture on policies and issues of concern to the national APHIS ADC program. The committee is composed of 20 individuals representing varied interests, including agricultural, environmental, and animal welfare organizations, and academic institutions.

APHIS ADC has adopted a management information system (MIS) that is being implemented in all States to assist in the assessment of program activities and impacts. This system will standardize data collection and reporting for the entire APHIS ADC program.

The control methods used by APHIS ADC are as species-specific as possible and are used with consideration for human safety. The following SOPs are examples of measures adopted to mitigate potential adverse impacts:

- Traps and snares are not set within 30 feet of exposed animal carcasses to prevent the capture of scavenging birds.
- Leghold trap underpan tension devices are used throughout the program to reduce hazards to nontarget wildlife that weigh less than the target species.
- Nontarget animals captured in leghold traps or foot snares are released unless it is determined by APHIS ADC field personnel that they will not survive.
- Aerial hunting teams are formally trained in the identification of target species from aircraft.
- Conspicuous, bilingual warning signs alerting people to the presence of traps, snares, and M-44s are placed at major access points when they are set in the field to control damage.
- Reasonable and prudent alternatives are complied with to avoid impacts to threatened and endangered species.
- The APHIS ADC decision model is designed to identify effective wildlife damage control strategies and their impacts.
- EPA-approved label directions are followed.
- The presence of nontarget species is monitored before using DRC-1339 to control blackbirds at feedlots and staging areas.

Research is an important process to develop mitigation measures for the current APHIS ADC program. APHIS ADC research has been conducted for many years to enhance and refine program effectiveness. Research is expected to continue for methods that show promise for increased target species selectivity and reduced hazards to nontarget species, and for effective nonlethal methods. The following examples are representative of mitigation-related research:

- Research to increase selectivity for target species includes studies of the leghold trap underpan tension device, the Livestock Protection Collar (LP Collar), and improved selectivity of odor lures.
- Research has been conducted to develop and evaluate the effectiveness of nonlethal control methods. Examples of such methods include electric fencing to exclude predators; padded-jaw traps to capture predators; nonlethal chemicals to capture nuisance birds and repel birds from feedlots, golf courses, and orchards; bird-resistant varieties of corn and sunflowers; habitat modification at bird roosts; lure crops to reduce forest damage; clay coatings to reduce damage to seed rice; scare devices for coyotes; relocation of golden eagles to reduce damage to sheep; and livestock guarding dogs.
- There has been an increased emphasis on research activities to evaluate nontarget hazards and environmental impacts associated with new and existing methods. Examples include primary and secondary hazards of the LP Collar, impacts of 1080 grain baits to control damage by ground squirrels, hazards of anticoagulant rodenticides to raptors, and hazards of using anticoagulants for controlling damage by mongooses to endangered species of birds.

Research activities are also conducted according to SOPs designed to avoid or minimize potential adverse impacts. All Denver Wildlife Research Center (DWRC) studies that involve significant amounts of time or effort are conducted in accordance with approved study protocols. Each protocol includes a description of the work to be done and includes consideration of potential adverse environmental impacts. Assessment of potential impacts to rare, threatened, or endangered species takes into consideration Federally designated species, State-listed species, and species of local concern.

Each study protocol is prepared by the study director, and must be approved by the appropriate Section Chief and the DWRC Director. Approval requires reviews by at least one peer (a DWRC scientist), a statistician, a quality assurance officer, and the Animal Care Committee. Progress is monitored by the quality assurance officer. The quality assurance officer must possess training in wildlife biology, and is assigned to conduct quality assurance on a full time basis.

The examples listed above highlight some of the most important elements of APHIS ADC's efforts to incorporate mitigation measures into its SOPs. The analysis of impacts and assessment of risks assumes that these measures (and others listed in APHIS ADC *Directives* and on pesticide labels) are followed in the course of conducting APHIS ADC operations and activities.

2. Potential Adverse Impacts of the Current Program Alternative

The analysis in this final EIS has identified the following potential adverse impacts:

- Although APHIS ADC program activities are not expected to impact populations of target and non-target species on a nationwide basis, there is a potential for adverse impacts to local populations or individuals.

- The USFWS Biological Opinion has identified eight animal species that may be jeopardized by the use of specific APHIS ADC control methods, as well as other species that may be adversely impacted by APHIS ADC activities, if USFWS "reasonable and prudent alternatives" are not implemented (see Appendix F). The eight species identified in the Biological Opinion are the following:
  - black-footed ferret
  - grizzly bear (Cabinet-Yaak Grizzly Bear ecosystem only)
  - San Joaquin kit fox
  - bald eagle (Southwest Recovery Unit only)
  - Attwater's greater prairie chicken
  - Mississippi sandhill crane
  - California condor
  - Wyoming toad
- The chemical methods risk assessment identified an overall impact rating for each individual chemical method. All products received a low rating except 14 chemical methods (8 of which are strychnine-based), which received a moderate rating. The following methods received a moderate rating:
  - 4-aminopyridine (0.5% formulation)
  - DRC-1339 (staging areas)
  - Strychnine: Corn Pigeon bait; Sparrow-Cracks; Bird toxicant; SRO 0.5% and 0.35% Milo, above-ground; SRO 0.5% and 0.35% Milo, below-ground; 1.6% rabbit paste; 4.9% marmot paste; 5.79% salt block
  - sodium nitrate (rodent gas cartridge)
  - zinc phosphide (concentrate for mouse control)
  - sodium cyanide (M-44 cyanide capsules)
  - sodium fluoroacetate (Compound 1080).
- Some groups, particularly those representing animal rights and humane groups (as defined in Chapter 3 and detailed in Chapter 4), could experience adverse sociocultural impacts (i.e., animal rights groups will not be satisfied with lethal control methods being used).

3. Potential Mitigation Measures for the Current Program Alternative

In addition to the SOPs currently employed in the APHIS ADC program, several measures have been identified for evaluation to further mitigate the potential impacts listed above. These measures generally relate to control method refinements, control method selection, protective measures for federally listed threatened or endangered species, or prerequisite conditions to be met before initiation of direct control activities.

a. Impacts to Local Wildlife Populations

Identification of the specific local populations that may be adversely impacted by site-specific APHIS ADC activities is beyond the scope of this programmatic document. However, the APHIS ADC national program will ensure that any activities that may

adversely impact local populations will be identified prior to implementation, and the following appropriate mitigation measures applied:

- Identify those proposed activities with a potential for adverse impacts when preparing annual work plans or other planning documents. In cases where potential adverse impacts are anticipated, initiate consultations with the appropriate agencies to determine any required additional environmental documentation. This will ensure that site-specific impacts are identified, and appropriate mitigation measures implemented.
- Provide training in NEPA procedures and implementation to appropriate administrative and field staff.
- Develop and use tranquilizer tabs on leghold traps to immobilize captured animals, thus reducing trap related injuries and increasing the likelihood that nontarget animals may be released successfully.
- Adopt a requirement for checking all traps and foot-snares daily to minimize the time that trapped animals will be restrained, thus reducing trap related injuries and increasing the likelihood that nontarget animals may be released successfully.
- Adopt the use of padded-jaw traps to reduce trap related injuries to captured animals.
- Establish minimal husbandry standards as a prerequisite to receiving APHIS ADC services.
- Amend APHIS ADC pesticide labels as appropriate to provide species specific protections for potentially affected threatened or endangered species.
- Implement APHIS ADC *Directive(s)* to provide species-specific protections for all threatened or endangered species that may be potentially affected by APHIS ADC program use of commercially registered pesticides.

b. Reasonable and Prudent Alternatives

In its Biological Opinion, the USFWS has identified reasonable and prudent alternatives and other measures designed to avoid potential impacts to threatened and endangered species. The USFWS Biological Opinion has been incorporated as Appendix F of this EIS. APHIS ADC will continue to comply with all appropriate protective measures and reporting requirements included in the USFWS Biological Opinion. The reasonable and prudent alternatives are listed below.

- Black-footed ferret
  - Prairie dog colonies shall be mapped in the vicinity of each colony that is proposed for control.
  - No prairie dog control shall be allowed in prairie dog complexes over 1,000 acres until the complex has been evaluated by the appropriate State and Federal agencies and until the complex has been block cleared (i.e., a large area of land that is free of black-footed ferrets, and not considered appropriate for ferret reintroduction).
  - Surveys for black-footed ferrets shall be conducted within 30 days of proposed treatments.
- Grizzly bear (Cabinet-Yaak Grizzly Bear Ecosystem)
  - All cage traps and foot snares set for black bears in areas occupied by grizzly bears shall be checked at least once a day.
  - Neck snares for black bears and mountain lions, and neck snares without breakaway locks for coyotes shall not be used in areas occupied by grizzly bears.

- San Joaquin kit fox
  - Snares, M-44s, toxicants, and fumigants shall not be used to control predators within the recognized occupied range of the San Joaquin kit fox.
  - Leghold traps used within the range of the San Joaquin kit fox shall be equipped with built-in pan tension devices such that at least 4.5 pounds of pressure is required to spring the trap.
  - Shooting shall be conducted only by APHIS ADC personnel trained and experienced in canine identification.
  - Zinc phosphide shall be the only chemical utilized for rodent control within the occupied range of the San Joaquin kit fox.
- Bald eagle (Southwest Recovery Unit)
  - New label and use restrictions must be developed to prohibit aboveground use of strychnine within a 10-mile radius of known eagle nest sites during the nesting period; or
  - USFWS Field Offices must be contacted for specific bald eagle habitat locations and nesting periods. The chemical could be applied only if the proposed use is determined to be outside of the delineated habitat.
- Attwater's greater prairie chicken
  - Tension devices shall be used on leghold traps in prairie chicken habitat to prevent prairie chickens from tripping the trap.
- Mississippi sandhill crane
  - M-44s or leghold traps shall not be used in designated critical habitat and other known nesting, roosting, and foraging habitat used by the Mississippi sandhill crane.
- California condor
  - In condor foraging habitat, M-44s shall be used in single sets, at least 1,000 feet from one another. The sets shall be placed so they do not protrude above ground level, and shall be covered or capped.
  - Strychnine shall not be used within condor-foraging habitat.
- Wyoming toad
  - Strychnine, zinc phosphide, aluminum phosphide, and gas cartridges shall not be used in areas of the Laramie River Basin where the Wyoming toad may occur.

Additional reasonable and prudent alternatives are presented in the USFWS Biological Opinion (Appendix F) as measures to preclude jeopardy to a variety of listed species. APHIS ADC will continue to comply with these alternatives to avoid impacts to these species.

c. Sociocultural

Using the list of organizations commenting on this final EIS as a point of departure, APHIS ADC will initiate contact with organizations that may experience adverse impacts. Such contacts will offer to provide information concerning APHIS ADC activities, to initiate jointly-funded control and research activities, and to establish other mechanisms for consultation.

D. Monitoring and Evaluation Procedures

The objective of environmental monitoring is to document the effects of a program on the environment and to use this knowledge in making any necessary adjustments or refinements to future program activities. Viewed in this way, environmental monitoring is an essential part of an agency's decision support system and a valuable program related feedback mechanism for agency decisionmakers. In addition to being a standard management practice, there are a variety of Federal and State statutes and regulations that require specific forms of environmental and health monitoring and reporting. These include NEPA, FIFRA, ESA, State wildlife regulations, and others.

In specific terms, environmental monitoring of the APHIS ADC program will provide a means to evaluate the impacts of wildlife damage management on both target and nontarget species as well as service recipients and ecological interest groups. This will be accomplished through collecting, compiling, summarizing, and analyzing information from sources both external and internal to APHIS. External sources for baseline data include, but are not limited to, responses from the public, scientific literature from journals, symposia, and reports from the USFWS and State wildlife agencies. Internal sources for information include data gathered by APHIS ADC field and research personnel.

In most cases, extensive monitoring is an existing requisite in APHIS ADC SOPs (e.g., monitoring to assure that nontarget species are not present before using DRC-1339 to control blackbirds at feedlots and staging areas (see label provisions for DRC-1339 in Appendix Q)). There are various data requirements associated with the use of M-44s, and APHIS ADC reporting requirements of the numbers, status, and disposition of animals taken in wildlife damage control operations. Collection and assessment of these data will form an important element of all environmental monitoring efforts. Additionally, short-term studies to gather specific data will be performed when necessary to augment the data routinely collected by APHIS ADC field personnel.

NEPA documentation will be prepared as required for all site-specific APHIS ADC actions and all such documentation will be reviewed by APHIS monitoring specialists. Of necessity, monitoring is a dynamic process; therefore, as site-specific conditions warrant, additional monitoring requirements will be developed and implemented to meet those conditions if SOP data gathering efforts are deemed to be insufficient to determine any potential environmental effects of program actions.

APHIS monitoring specialists will summarize and analyze the environmental data collected by APHIS ADC. These findings will form an annual report that will provide a means of determining the environmental effects, if any, of the program. If indicated, additional mitigations may be adopted or research conducted to further refine APHIS ADC damage control techniques.

E. Nonlethal Control Program Alternative

1. Potential Adverse Impacts of the Nonlethal Control Program Alternative

APHIS ADC may be incapable of handling many wildlife damage control complaints. Other agencies, States, or individuals may handle wildlife damage complaints not handled by APHIS ADC. Impacts may be similar to those of the No Action Alternative.

2. Potential Mitigation for the Nonlethal Control Program Alternative

- Combine nonlethal control methods with damage compensation control methods.
- Eliminate certain actions when nonlethal control methods fail to resolve a conflict (e.g., discontinue the raising of sheep where coyotes are a chronic problem; close airports when birds are a hazard to human safety).
- Make nonlethal control tools available without cost to resource managers.
- Increase research funding for nonlethal control methods.

F. Nonlethal Before Lethal Control Program Alternative

1. Potential Adverse Impacts of the Nonlethal Before Lethal Control Program Alternative

The Nonlethal Before Lethal Control Program Alternative may have increased costs. Attempts to impose nonlethal methods as a first option where they are unlikely to be affective will result in additional losses and/or expenditures for control. The potential health and safety risks may remain during the period of time nonlethal methods are tested. During that period of time, resource managers may have to go elsewhere for assistance.

2. Potential Mitigation for the Nonlethal Before Lethal Control Program

- Combine nonlethal before lethal control methods with damage compensation control methods until either nonlethal methods work or lethal methods are used.
- Increase research funding for nonlethal methods.
- Seek APHIS ADC authority to regulate husbandry standards (night penning, fencing, guarding dogs, etc).

G. Damage Compensation Program Alternative

1. Potential Adverse Impacts of the Compensation Program Alternative

In many cases the impacts may be the same as the No Action Alternative. Economic losses will be far greater then could be compensated for and would grow every year. There will be no compensation for nonagricultural damage and threats to human health and safety.

2. Potential Mitigation for the Compensation Program Alternative

- Require that some minimum level of animal husbandry be practiced by the claimant to be eligible for compensation payment.
- Implement a partial compensation program.
- Implement compensation after a minimum economic loss has been reached.

- Transfer lethal chemical control methods solely registered for use by APHIS ADC to other agencies, States, and individuals.
- Expand the authorized users of lethal methods for use by agencies, States, and individuals.
- Increase law enforcement funds for other agencies to deter possible abuse of wildlife control techniques.
- Seek regulatory, investigative, and law enforcement authority for APHIS ADC.
- Seek APHIS ADC's authority to alter habitat on public and private lands.
- Use forms of compensation other than actual cash for losses suffered.

Appendices

Appendix A

References

Appendix A

References

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Appendix B

Acronyms and Glossary

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Acronyms

ADC	Animal Damage Control (program)
APHIS	Animal and Plant Health Inspection Service
BCF	Bioconcentration Factor
BLM	Bureau of Land Management
CEQ	Council on Environmental Quality
DEIS	Draft Environmental Impact Statement
DWRC	Denver Wildlife Research Center
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ES	Extension Service
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FDA	Food and Drug Administration
FEIS	Final Environmental Impact Statement
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FONSI	Finding of No Significant Impacts
FY	Fiscal Year
GLP	Good Laboratory Practices
HSDB	Hazardous Substances Data Bank
IPM	Integrated Pest Management
LP	Livestock Protection (Collar)
MIS	Management Information System
MOU	Memorandum of Understanding
NASS	National Agricultural Statistical Service
NEPA	National Environmental Policy Act
NPS	National Park Service
OMB	Office of Management and Budget
PSD	Pocatello Supply Depot

ROD	Record of Decision
SEIS	Supplement to the Draft Environmental Impact Statement
T&E	Threatened and Endangered Species
USDA	U.S. Department of Agriculture
USDI	U.S. Department of the Interior
USDOT	U.S. Department of Transportation
USEPA	U.S. Environmental Protection Agency
USFS	USDA Forest Service
USFWS	U.S. Fish and Wildlife Service
USITC	U.S. International Trade Commission

Terms

A

ABUNDANCE The number of individuals in a population of a species in a given unit of area.

ACTIVE INGREDIENT (A.I.) The chemical or chemicals in a pesticide formulation responsible for the desired effects.

ADSORPTION The affinity of a chemical substance for particulate surfaces. It is an important factor affecting environmental movement and fate of chemicals.

ADVERSE IMPACT/EFFECT A condition caused by a specific action that results in harm to an organism or its habitat.

AGRICULTURAL RESOURCES Crops and livestock potentially damaged by wildlife.

AIRCRAFT STRIKES Collisions occurring between wildlife and aircraft on the ground or in the air. Aircraft strikes represent a potential for substantial damage to aircraft and severe injury or death to humans.

ALLOWABLE HARVEST LEVEL That portion of the population that can be removed without affecting the long-term maintenance of the species.

ANIMAL BEHAVIOR MODIFICATION The use of scaring tactics to deter or repel animals that cause loss or damage to resources or property. It includes the use of electronic distress sounds, propane exploders, pyrotechnics, lights, scarecrows, water spray devices, and repellents.

ANIMAL DAMAGE CONTROL ACTIVITIES/FUNCTIONS A program of actions to provide wildlife damage management through direct control or technical assistance to achieve desired management objectives.

ANIMAL RIGHTS A philosophical and political position that animals have inherent "rights" comparable to those of humans.

ANIMAL WELFARE Concern for the well-being of the individual animal, unrelated to the perceived rights of the animal or the ecological dynamics of the species.

ANIMAL/LIVESTOCK HUSBANDRY The use of livestock management practices, such as shed lambing, changing livestock types or breeds, altering breeding seasons, or employing herders and guard dogs, to reduce mortality due to adverse weather, predation, or other causes.

ANTICOAGULANTS Chemicals, particularly rodenticides, that cause death by interfering with animals' blood clotting mechanisms.

AQUACULTURE The cultivation and production of fish and shellfish as an agricultural crop.

AVERAGE RELATIVE ABUNDANCE FOR BIRDS The average number of birds seen/heard on bird survey routes used during the analysis period.

AVIAN FRIGHTENING AGENT	A chemical used to scare birds away from a crop or other resource.
AVICIDE	A pesticide used to control or reduce damage caused by birds.
AVOIDED LOSS	The value or amount of livestock, crops, or other resources saved by applying wildlife damage control measures.

B

BAIT	A lure or attractant consisting of a target animal's preferred food, fetid meat, urine, or musk.
BAIT-SHY	Animal avoidance of a bait, usually due to taste, smell, or negative prior experience.
BEHAVIOR MODIFICATION	See Animal behavior modification.
BENEFICIAL IMPACT/EFFECT	A condition caused by a specific action that improves the well-being of an organism or its habitat.
BIOCONCENTRATION	The property of some chemicals to collect in tissues of certain species at concentrations higher than surrounding environment. This may occur through uptake of water, dermal penetration from skin exposure, respiratory intake, or consumption of contaminated components of the environment.
BIOCONCENTRATION FACTOR (BCF)	The concentration of a chemical in an organism, or in the tissue of an organism, divided by the concentration in water.
BIODEGRADATION	The process of decomposition of a substance aided by the action of microorganisms.
BIOLOGICAL CONTROL	The planned use of one or more organisms to reduce or regulate other organisms.
BIOLOGICAL IMPACT	Any impact to animal abundance or species diversity.
BIOLOGICAL OPINION	The written result of a Section 7 Consultation, as required by the Endangered Species Act (ESA), conducted by Federal agencies with the U.S. Department of Interior, Fish and Wildlife Service (USFWS). The opinion of the USFWS as to whether or not the Federal action is likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat. (See SECTION 7 CONSULTATION.)
BIOMAGNIFICATION	The process by which a chemical concentrates as it moves through the food chain.
BOUNTY SYSTEM	A program intended to control wildlife damage by paying monetary rewards for proof of taking designated wildlife species.

C

CANID	A coyote, dog, fox, wolf, or other member of the dog (Canidae) family.
CARNIVORE	An animal that lives primarily on a diet of meat.
CARRYING CAPACITY	The number of animals a given unit of habitat can support.
CHEMICAL CONTROL METHODS	Toxicants (including fumigants and anticoagulants), repellents, frightening or stressing agents, and drugs used to control wildlife damage.
CLUTCH	A nest of eggs or a brood of chicks.
COMMENSAL RODENT	A rodent that lives in close proximity to humans (e.g., Norway rat, roof rat, house mouse).
COMPENSATION	Monetary reimbursement for loss of agricultural resources.

COMPLAINANT	The person, organization, or agency that reports wildlife damage and requests APHIS ADC program assistance in controlling it.
COMPLAINT	A request for assistance received by APHIS ADC program personnel that involves description of specific damage caused by a wildlife species.
CONFIRMED LOSSES	Wildlife-caused losses or damages verified by APHIS ADC personnel. These figures usually represent only a fraction of total losses.
CONFLICT (with wildlife)	A situation in which the activities of a wildlife species disrupt man's planned use of a particular area or resource.
CONSERVATION	See Wildlife conservation.
CONTROL	See Wildlife damage control.
COOPERATIVE AGREEMENT	A written agreement between agencies, institutions, or individuals. It specifies mutual intent to work together for specific purposes, such as wildlife damage control, and may detail the role of each party to the agreement.
COOPERATIVE PROGRAM	A program under which APHIS ADC and others agree on a specific plan of action for wildlife damage control activities.
COOPERATOR	An individual or agency working under agreement with the APHIS ADC program. These organizations may contribute funds, facilities, and personnel to conduct wildlife damage control.
CORRECTIVE CONTROL	Control actions applied when damage is occurring or after it has occurred. (See PREVENTIVE CONTROL/KILLING.)
COST:BENEFIT RATIO	An indicator of economic efficiency, computed by dividing benefits by costs.
CRITICAL HABITAT	The essential segment(s) of habitat that contains the unique combination of conditions (i.e., vegetation, topography, soils, species niches, etc.) necessary for the continued survival of an endangered or threatened species, as listed in 50 CFR 17 or 226.
CUMULATIVE IMPACTS	The impacts on the environment resulting from the incremental impact added to past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions occurring over time.

D

DENNING/DEN HUNTING	The process of locating burrows where predators (primarily coyotes) have their young, then killing the pups. The adult predators also may be killed.
DEPREDATING SPECIES	An animal species causing damage to or loss of crops, livestock, other agricultural resources, or wildlife.
DEPREDATION	The act of killing, damaging, or consuming animals, crops, or other agricultural resources.
DIRECT CONTROL	The conduct or supervision of wildlife damage control activities. (See TECHNICAL ASSISTANCE.)
DIRECT IMPACT/EFFECT	A condition caused by a direct action that occurs at the same time and place. (See INDIRECT IMPACT/EFFECT.)
DIVERSITY	The number of species in a specific area.
DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS)	The preliminary environmental document as required by Section 102 of the National Environmental Policy Act (NEPA), which requires that a statement of environmental effects for a major Federal action be released to the public and other agencies for comment and review prior to the final environmental document and the management decision.

DRAW STATION — A livestock carcass, bone pile, or scented control area for the purpose of attracting target species, particularly coyotes.

DURATION — A criterion used in this final Environmental Impact Statement (EIS) to evaluate the significance of APHIS ADC program impacts on target species abundance. Duration refers to the length of time the control activity has been or could be in operation.

E

ECOLOGICAL COMMUNITY — Any assemblage of populations living in a specific habitat.

ECOLOGICAL INTEREST GROUP — A structured or unstructured association whose interest or activity is related to the biological environment.

EFFICACY — The ability to produce a desired effect or intended result; the effectiveness of a wildlife damage control tool or action.

ENDANGERED SPECIES — A species in danger of extinction throughout all or a significant part of its range.

ENVIRONMENT — The surrounding conditions, influences, or forces that affect or modify an organism or an ecological community and ultimately determine its form and survival.

ENVIRONMENTAL BEHAVIOR — An expression in terms of a chemical's stability and reactivity.

ENVIRONMENTAL IMPACT STATEMENT (EIS) — A document prepared by a Federal agency to analyze the anticipated environmental effects of a planned action or development.

ENVIRONMENTAL MEDIA PARTITIONING — The equilibrium distribution among different components of a chemical in the environment based on its physical and chemical characteristics as well as those of the environment to which it is exposed.

ENVIRONMENTAL MEDIA/MEDIUM — Components including soil, sediment, surface water, groundwater, and air.

ENVIRONMENTALIST — A person who is concerned about the conservation and quality of the human environment.

EPIZOOTIC — A disease that affects many animals of one species at the same time.

ERADICATION — Elimination of specific pest wildlife populations from designated areas.

EVAPORATION HALF-LIFE ($t_{1/2}$) — The release or loss of at least 50 percent of a chemical substance through the process of evaporation or volatility in a unit of time.

EXCLUSION DEVICES — Fences or other physical barriers used to keep depredating, nuisance, or other damaging wildlife species away from livestock, crops, or other resources that require protection.

EXOTIC SPECIES — A species that is not native or indigenous to an area (e.g., Norway rat, starling, rock dove, and house sparrow in North America). (See INTRODUCED SPECIES.)

EXPOSURE ANALYSIS/ASSESSMENT — For the receptor population, an evaluation of potential pathways by which either humans or sensitive environmental habitats are impacted. If an exposure pathway is incomplete, it does not warrant further consideration in the exposure assessment.

EXPOSURE PATHWAY — A concept used in environmental partitioning analysis. A complete exposure pathway consists of contaminant source(s), transport media (e.g., surface water or soils), the contact point between the transport medium and the receptor (e.g., water supply system), and the receptor route or mechanism of entry (e.g., ingestion of water, biota, or inhalation of dust). If an exposure pathway is incomplete, it does not warrant further consideration in the analysis.

F

FINAL ENVIRONMENTAL IMPACT STATEMENT (FEIS) — A document prepared following incorporation of public and agency comments on the DEIS. This will be used as a guide for decisions on future APHIS ADC program assessments and Environmental Assessments (EAs).

FISCAL YEAR (FY) — A financial planning and accounting year. For the Federal Government, the fiscal year extends from October 1 through September 30 of the next year.

FLEDGLING PERIOD — The period required for a young bird to grow the feathers necessary for flight.

FORAGE — Food for animals, especially when taken by browsing or grazing.

FORMULATION — A pesticide product ready for application. Also refers to the process of manufacturing or mixing a pesticide product in accordance with the U.S. Environmental Protection Agency (USEPA)-approved formula.

FREQUENCY — A criterion used in this EIS to evaluate the significance of impacts on target species abundance. Frequency refers to the distinction between continual and seasonal or intermittent control activity.

FRIGHTENING DEVICES — Pyrotechnics, propane exploders, flashing lights, balloons, streamers, distress calls, and other scare methods used to move or disperse wildlife that are causing damage or problems in particular areas. (See HARASS/HARASSMENT.)

FUMIGANT — A chemical or chemical mixture, usually in liquid, gaseous, or solid form, that volatilizes to produce lethal fumes.

FURBEARER — An administrative or legal grouping of mammal species that are harvested for their fur.

G

GEOGRAPHIC EXTENT — A criterion used in this EIS to evaluate the significance of APHIS ADC program impacts on target species abundance. Geographic extent refers to the percentage of States within a species range within which individuals of that species were killed.

H

HABITAT — An environment that provides the requirements (i.e., food, water, and shelter) essential to development and sustained existence of a species.

HABITAT IMPROVEMENT — Management of wildlife and fish habitats to increase their "carrying capacity" or ability to support specified kinds of wildlife or fish.

HABITAT MANAGEMENT — Protection or modification of a habitat to maintain, increase, or decrease its ability to produce, support, or attract designated wildlife species.

HABITAT MODIFICATION — See Habitat management.

HARASS/HARASSMENT — Application of frightening devices with the intent of causing a target wildlife species to leave an area. (See FRIGHTENING DEVICES.)

HARVEST DATA — An estimation of the number of animals removed from a population.

HARVEST RATE/LEVEL — For any given wildlife species, the harvest rate or harvest level represents a ceiling population value established by wildlife management specialists to regulate the harvest of a species. This value represents a proportion of the entire population that can be taken without adversely affecting the long-term maintenance of that population.

HARVESTABLE VALUE — Refers to agricultural crops and their actual or potential economic value at harvest.

HAZARD — Inherent toxicity or dangerous features of a wildlife damage control chemical or method. Intrinsic, potentially harmful or adverse effect of a wildlife damage management method. (See RISK.)

HUMANENESS — The perception of compassion, sympathy, or consideration for animals.

HYDROLOGIC CYCLE — The complete cycle through which water passes, from the oceans, through the atmosphere, to the land, and back to the ocean.

HYDROSPHERE — The water portion of the earth, as distinguished from the solid part (lithosphere) and from the gaseous outer envelope (atmosphere).

I

IMPACT EVALUATION — The analysis of the magnitude, geographic extent, duration and frequency, and likelihood of an impact occurring.

INCIDENTAL TAKE — Animals that are removed unintentionally as a result of wildlife damage control activities.

INDIGENOUS SPECIES — Any species of wildlife native to a given land or water area.

INDIRECT IMPACT/EFFECT — A condition caused by an action that occurs later in time or farther removed in distance but is still reasonably foreseeable. (See DIRECT IMPACT/EFFECT.)

INHUMANE — Lacking compassion, sympathy, or consideration for animals.

INTEGRATED PEST MANAGEMENT (IPM) — The process of integrating and applying practical methods of prevention and control to keep pest situations from reaching damaging levels while minimizing potentially harmful effects of pest control measures on humans, nontarget species, and the environment.

INTENSIVE CONTROL AREA — A geographical area where control actions are required on a more or less continual basis to keep damage from wildlife at an acceptable level.

INTEREST GROUP — Any group, formal or otherwise, with a specialized set of shared preferences about how resources should be used or allocated.

INTERSPECIFIC COMPETITION — Rivalry between organisms of different species for resources in short supply.

INTRODUCED SPECIES — Any species of wildlife not native to a given land or water area and introduced by man. (See EXOTIC SPECIES.)

J

JEOPARDY/JEOPARDIZE — To engage in an action that would reasonably would be expected, directly or indirectly, to reduce the likelihood of both the survival and recovery of a threatened or endangered species by reducing the reproduction, numbers, or distribution of that species.

L

LCL_o (LETHAL CONCENTRATION LOW) — The lowest recorded concentration of a substance in air that has caused death in humans or animals. The reported concentrations may be for periods of exposure less than 24 hours (acute) or greater than 24 hours (subacute and chronic).

LC_{50} (LETHAL CONCENTRATION 50 PERCENT KILL) — A calculated dose of a substance expected to cause the death of 50 percent of an entire defined experimental population. The dose is determined by exposing a number of individuals from that population to various concentrations of the substance in air,

water, or bait and calculating the population parameter from mortality observed at these concentrations.

LDLo (LETHAL DOSE LOW) — The lowest dose of a chemical that has caused death in humans or animals.

LD_{50} (LETHAL DOSE 50 PERCENT KILL) — A calculated dose of a substance expected to cause the death of 50 percent of an entire defined experimental population. The dose is determined by exposing a number of individuals from that population to various concentrations of the substance by any route other than inhalation and calculating the population parameter from mortality observed at these concentrations.

LETHAL CONTROL METHODS/ TECHNIQUES — Control methods or techniques that result in the death of animals (e.g., M-44s, aerial shooting, calling and ground shooting, and denning).

LIKELIHOOD — A criterion used in this EIS to assess the significance of impacts on target species abundance. Likelihood refers to the probability of control actions continuing to occur.

LIVESTOCK "PROTECTED OR AFFECTED" — Livestock affected directly through control efforts or indirectly by control efforts on adjacent or surrounding lands.

LOCAL IMPACT — The effect of actions on the smallest land area affected and considered in this EIS.

LONG-TERM — An action, trend, or impact that affects the potential of a species to maintain its population through reproduction or immigration over an extended period of time.

LOW IMPACT — See MODERATE IMPACT.

LURE CROPS — Crops planted or left for consumption by wildlife as an alternative food source. This provides relief for critical crops by sacrificing less important or specifically planted fields.

M

MAGNITUDE — A criterion used in this EIS to evaluate the significance of impacts on target species abundance. Magnitude refers to the number of animals taken in relation to their abundance.

MANAGEMENT (OF WILDLIFE) — See Wildlife management.

MARICULTURE — The cultivation of marine fish and shellfish.

"MAY AFFECT" — As used in this EIS, the potential for an action to impact an endangered or threatened species. "May affect" determinations are part of the Endangered Species Act Section 7 Consultation process.

MECHANICAL/PHYSICAL BARRIER — An obstacle built or placed to prevent a specific animal species from entering or leaving an area (e.g., a fence, wall, or shield).

MEMORANDUM OF UNDERSTANDING (MOU) — An agreement between governmental agencies that specifies each agency's authorities and responsibilities in areas of mutual interest.

MITIGATION — An action undertaken to avoid, minimize, rectify, reduce, or compensate for an adverse impact.

MODELING — Mathematical representation or simulation of real world processes, such as animal population responses to various harvest levels.

MODERATE IMPACT — A significance rating based on the collective assessment of impacts. Impacts with collective ratings of low or moderate are not considered significant under NEPA.

MONITOR — To observe and record the activities or results of a particular project, population, or operation.

MULTIPLE-USE MANAGEMENT — The concept of managing public lands for a variety of objectives.

N

NATIONAL ENVIRONMENTAL POLICY ACT (NEPA) Passed by Congress in 1969, NEPA declared a national policy to encourage productive harmony between humans and their environment, to promote efforts that will prevent or eliminate damage to the environment and the biosphere and stimulate the health and welfare of humans, to enrich the understanding of the ecological systems and natural resources important to the nation, and to establish a Council on Environmental Quality (CEQ). This act requires the preparation of EISs for major Federal actions. This basic national charter for the protection of the environment establishes policies, goals, and procedures to ensure that Federal agency actions protect, restore, and enhance the environment.

NEGATIVE IMPACT/EFFECT See ADVERSE IMPACT/EFFECT.

NONAGRICULTURAL RESOURCES Resources other than crops and livestock potentially damaged by wildlife (e.g., structures and vehicles).

NONLETHAL CONTROL METHODS/TECHNIQUES Control methods or techniques that do not result in death of the target animal (e.g., live traps, repellents, fences, guard dogs, etc.).

NONTARGET SPECIES/ANIMAL An animal or local population that is inadvertently captured, killed, injured, or otherwise adversely affected by wildlife damage control activities directed toward target animals. (See TARGET SPECIES/ANIMAL.)

NUISANCE WILDLIFE Animals that cause annoyance or inconvenience. Economic losses are typically not expected from nuisance problems.

O

OBJECTIVE SURVEY A statistically valid means of measuring crop and livestock losses by sampling representative plots, fields, herds, or other resource units. (See SUBJECTIVE SURVEY.)

OCTANOL-WATER PARTITION COEFFICIENT (log P/log Kow) The ratio of the equilibrium concentration of a dissolved substance in a two-phase system consisting of two largely immiscible solvents, n-octanol (an organic liquid) and water. This parameter is used to estimate soil organic matter/water partition coefficient (Q) to ascertain the retention of a chemical on soil organic matter and its mobility in water.

OFFSET JAW TRAP Traps constructed or altered so that a gap remains between the jaws after they are closed.

OMNIVORE/OMNIVOROUS An animal that eats both animal and plant matter; a generalist, opportunistic feeder that eats whatever is available.

OPEN RANGE Unfenced grazing lands.

P

PARITY Market value of a crop or resource. Compensation at parity for wildlife-caused losses would require payment equivalent to 100 percent of the value of resources lost.

PARTITIONING ANALYSIS An analysis to determine potential distribution of chemicals within soil-to-water, water-to-air, and soil-to-air pathways.

PASTURELAND Land used principally for production of forage for livestock grazing.

PEST Any organism that damages or interferes with human activities.

PEST WILDLIFE	Wildlife that damage crops, livestock, or other resources, or create nuisance or health and safety problems.
PESTICIDE	A chemical substance used to control pest wildlife.
PHOTODEGRADATION	The process by which substances are decomposed or detoxified by exposure to sunlight.
POPULATION	A group of organisms of the same species that occupies a particular area.
POPULATION MANAGEMENT	In wildlife damage control, the process of controlling wildlife populations to reduce damage.
POSITIVE IMPACT/EFFECT	See Beneficial impact/effect.
PREBAITING	Placement of untreated bait to precondition target wildlife to accept treated bait. Prebaiting is done before placement of some pesticides to enhance pesticide acceptance.
PREDATOR	An animal that kills and consumes another organism.
PREDACIDE	A pesticide used to kill predators.
PREFERENTIAL RESIDENCE	The likely environmental medium that serves as a sink for a chemical based on its physical and chemical characteristics. The chemical is likely to remain in the medium until it undergoes transformation.
PRESERVATION	See Wildlife preservation.
PREVENTIVE CONTROL/KILLING	Control measures applied before damage begins. (See CORRECTIVE CONTROL.)
PREY	An animal that is killed and consumed by a predator.
PRIMARY POISONING	Also PRIMARY TOXICITY; death or injury of target or nontarget organisms that result from the direct consumption of, or exposure to, toxic substances in their originally applied form. (See SECONDARY POISONING.)
PUBLIC LAND	Land that is owned and controlled by a government unit (i.e., Federal, State, regional, county, or other municipal jurisdiction).
PYROTECHNICS	Fireworks or projectiles used to frighten wildlife.

R

RANGE ALLOTMENT	An area, usually on public land, allocated for the use of a prescribed number of grazing animals under a management plan.
RANGE CONDITION	The relative status of rangeland in terms of available forage.
RANGE LAMBING	Lambs born in an open-range or pasture situation.
RANGELAND	Land on which the natural plant cover is made up primarily of native grasses, forbs, or shrubs valuable for forage.
RAPTORS	Carnivorous bird species (e.g., owls, hawks, falcons) that prey on other birds, amphibians, reptiles, and mammals.
RECEPTORS/RECEPTOR POPULATION	Segments of a population that will come in frequent contact with chemicals of concern or contaminated media.
REGISTERED CHEMICAL	A chemical that has been approved by the appropriate governmental agency(ies), such as the USEPA, for use in a specific formulation and for a specified purpose, such as a rodenticide for control of rodents.
REPELLENT	A substance with a taste, odor, or feel that discourages a specific animal or species from using a food or place.
REPRODUCTIVE CAPACITY	The reproductive potential of a species.

RESIDENT SPECIES — Animal species that do not normally migrate in response to seasonal changes and are generally managed by State agencies.

RESTRICTED USE PESTICIDE — A pesticide that has been classified by USEPA or an appropriate State agency as possessing the potential to cause adverse effects on the environment when not applied in accordance with label use restrictions. Restricted use pesticides can only be applied by or under the supervision of a certified applicator.

RISK — A potential adverse effect associated with exposure to a wildlife damage management action or method. Hazard plus exposure defines risk. (See HAZARD.)

RODENTICIDE — A toxicant specifically designed to kill rodent species.

ROOST/ROOSTING SITE — A place where birds congregate for resting or sleeping. Roosts are commonly located in trees, shrubbery, aquatic vegetation, certain agricultural crops, and manmade structures.

S

SCAVENGER — An animal that habitually feeds on refuse or carrion.

SCOPING — A NEPA process that occurs early in the development of an EIS; it identifies the significant issues related to a proposed action.

SECONDARY POISONING — Intoxication resulting from feeding on the carcass or gastrointestinal tract contents of an animal that died from ingesting toxic materials.

SECTION 7 CONSULTATION — A provision under Section 7 of the Endangered Species Act requiring consultation between Federal agencies and the USFWS. The Federal agency identifies all potential impacts to threatened and endangered species that a particular activity might cause. The Federal agency ensures its actions are not likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat. (See BIOLOGICAL OPINION.)

SELECTIVE CONTROL — Control actions that affect specific animals or animal species responsible for damage without adversely affecting other species occurring in the same habitat.

SHED LAMBING — Holding ewes and newborn lambs in pens or sheds to provide food, shelter, and medical care during and after birth.

SHORT-TERM — An action, trend, or impact that does not last long enough to affect the reproductive or survival capabilities of a species.

SIGHT BAIT — A visible animal carcass or part thereof or any other visible item used to attract target animals.

SIGNIFICANCE CRITERIA — The factors used to measure the intensity of the impact of an action. In this EIS, magnitude, geographic extent, duration and frequency, and likelihood are used to measure the impact intensity, which is categorized as low, moderate, or significant. (See SIGNIFICANT IMPACT.)

SIGNIFICANT IMPACT — An impact that will cause important positive or negative consequences to man and his environment. (See SIGNIFICANCE CRITERIA.)

SOCIOCULTURAL ENVIRONMENT — The diverse attitudes, values, perceptions, lifestyles, and livelihoods of the American public.

SPECIES DIVERSITY — See DIVERSITY.

SPECIFIC GRAVITY — The parameter indicating whether a chemical will sink or float in water, which aids in identifying a chemical's distribution and movement when in high concentrations in surface water or groundwater.

SUBJECTIVE SURVEY	A means of estimating crop and livestock losses from information provided by producers from questionnaires or interviews. (See OBJECTIVE SURVEY.)
SUGARBUSH	A forest stand where sugar maples are managed for the production of maple sap.
SUPPRESSION	Efforts directed toward planned, long-term reduction of specific pest wildlife populations in designated areas.
SUSTAINED YIELD (OF WILDLIFE)	The management of wildlife to ensure continued harvest for food, economic benefit, or recreation.
SYNERGISTIC EFFECTS	The result of combined action of two or more substances or agencies to achieve an effect greater than that of which each is individually capable.

T

TAKE	The capture or killing of an animal.
TARGET SPECIES/ANIMAL/POPULATION	An animal or local population to which wildlife damage control activities are directed to alleviate damage to agricultural and nonagricultural resources or prevent hazards to public health and safety. Any animal species may be either a target or nontarget, depending on the situation.
TECHNICAL ASSISTANCE	Advice, recommendations, information, and materials provided by APHIS ADC program employees for others to use in managing wildlife damage problems. (See DIRECT CONTROL.)
THREATENED SPECIES	Any species likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.
TIMBERLAND	Forest land that is producing or is capable of producing harvestable timber.
TL50	Toxic substance level in an aquatic body at which a 50 percent kill rate is achieved. Also expressed as LC_{50}.
TLM (MEDIAN TOLERANCE LIMIT)	The concentration of a toxicant or substance in an aquatic body at which 50 percent of the test organisms survive.
TOTAL HARVEST	The total number of individuals intentionally taken by man from a population. Harvest does not include natural or accidental mortality.
TOXICANT	A poison or poisonous substance.
TRAIL SETS	Concealed traps or snares used without lures or attractants and set in a natural travelway.
TROPHIC LEVEL	The level in a biological community at which an organism exists relative to producer species (i.e., plants) and consumer species (i.e., herbivores or carnivores).

U

UNCONFIRMED LOSSES	Losses or damage reported by resource owners or managers but not verified by APHIS ADC personnel. (See CONFIRMED LOSSES.)

V

VAPOR PRESSURE	A measure of the tendency of pure substances to vaporize in an unperturbed situation. Vapor pressure provides a basis for ranking the relative volatility of chemicals.
VERIFIED LOSSES	See Confirmed losses.

W

WATER SOLUBILITY — The parameter that helps identify a chemical's mobility in water media. The more soluble a chemical, the quicker it will be distributed through the hydrologic cycle.

WETLANDS — Areas inundated by surface water or groundwater frequently enough to support vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction.

WILDERNESS AREA — Undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation, protected and managed to preserve its natural conditions.

WILDLIFE — Any wild mammal or bird.

WILDLIFE CONSERVATION — Wise use of wildlife resources.

WILDLIFE DAMAGE CONTROL — The component of wildlife management directed at alleviating damage or other problems caused by or related to the presence of wildlife.

WILDLIFE HABITAT — See HABITAT.

WILDLIFE MANAGEMENT — The science and art of changing the characteristics and interactions of habitats, animal populations, and humans to achieve specific human goals.

WILDLIFE PRESERVATION — The protection and nonconsumptive use of wildlife.

WORK PLAN — The annual plan supplementing a cooperative agreement between agencies, institutions, or individuals that outlines how personnel and financial resources will be assigned to accomplish intended objectives, and establishes the financial obligations of all parties to the agreement.

Z

ZOONOTIC DISEASE — A disease communicable from wildlife and other animals to humans under natural conditions.

Appendix C

Common and Scientific Names of Species

Appendix C

Common and Scientific Names of Species

Mammals

Armadillo	*Dasypus novemcinctus*
Badger	*Taxidea taxus*
Bat	Order Chiroptera
Bear, black	*Ursus americanus*
Bear, grizzly	*Ursus arctos*
Beaver	*Castor canadensis*
Bobcat	*Lynx rufus*
Cat, house (domestic)	*Felis silvestris*
Coyote	*Canis latrans*
Coati	*Nasua nasua*
Cow, domestic	*Bos taurus*
Deer	*Odocoileus* species
Deer, mule (black-tailed)	*Odocoileus hemionus (columbianus)*
Deer, white-tailed	*Odocoileus virginianus*
Dog, domestic	*Canis familiaris*
Elk	*Cervus elaphus*
Fox	Family Canidae
Fox, arctic	*Alopex lagopus*
Fox, gray	*Urocyon cinereoargenteus*
Fox, kit	*Vulpes macrotis*
Fox, red	*Vulpes vulpes*
Fox, San Joaquin kit	*Vulpes macrotis lutica*
Fox, swift	*Vulpes velox*
Goat, feral	*Capra hircus*
Gopher	Family Geomyidae
Gopher, pocket	*Thomomys* and *Geomys* species

Hare	*Lepus* species
Horse	*Equus caballus*
Jackrabbit	*Lepus* species
Marmot	*Marmota* species
Mink	*Mustela vison*
Mole	Family Talpidae
Mongoose, Indian	*Herpestes auropunctatus*
Monkey, Rhesus	*Macaca mulatta*
Moose	*Alces alces*
Mountain beaver	*Aplodontia rufa*
Mountain lion	*Felis concolor*
Mouse	Families Heteromyidae and Muridae
Mouse, house	*Mus musculus*
Mouse, Perdido Key beach	*Peromyscus polionotus trissyllepsis*
Muskrat	*Ondatra zibethicus*
Nutria	*Myocastor coypus*
Opossum	*Didelphis virginiana*
Otter, river	*Lutra canadensis*
Peccary (javelina)	*Tayassa tajacu*
Pig (swine, Russian boar, feral hog)	*Sus scrofa*
Porcupine	*Erethizon dorsatum*
Prairie dog	*Cynomys* species
Prairie dog, black-tailed	*Cynomys ludovicianus*
Prairie dog, Gunnison's	*Cynomys gunnisoni*
Pronghorn (antelope)	*Antilocapra americana*
Rabbit	*Sylvilagus* species
Rabbit, cottontail	*Sylvilagus* species
Raccoon	*Procyon lotor*
Rat	Family Muridae
Rat, black (roof)	*Rattus rattus*
Rat, cotton	*Sigmodon* species
Rat, kangaroo	*Dipodomys* species
Rat, Norway	*Rattus norvegicus*
Rat, pack (bushy-tailed woodrat)	*Neotoma cinerea*
Ringtail	*Bassariscus astutus*
Rodent	Order Rodentia
Rodent, commensal	Family Muridae

Sea lion	Family Otariidae
Sheep, bighorn	*Ovis canadensis*
Sheep, domestic	*Ovis aries*
Skunk	Family Mustelidae
Skunk, hognose	*Conepatus* species
Skunk, spotted	*Spilogale putorius*
Skunk, striped	*Mephitis mephitis*
Squirrel, fox	*Sciurus niger*
Squirrel, gray	*Sciurus* species
Squirrel, ground	*Spermophilus* species
Squirrel, flying	*Glaucomys* species
Squirrel, red	*Tamiasciurus hudsonicus*
Squirrel, tree	*Sciurus* species
Vole	Subfamily Arvicolinae
Weasel	*Mustela* species
Wolf, gray (timber)	*Canis lupus*
Woodchuck	*Marmota monax*
Woodrat (packrat)	*Neotoma* species

Birds

Albatross species	*Diomedea* species
Blackbird group	Subfamily Icterinae
Blackbird, Brewer's	*Euphagus cyanocephalus*
Blackbird, Red-winged	*Agelaius phoeniceus*
Blackbird, Rusty	*Euphagus carolinus*
Blackbird, Tricolored	*Agelaius tricolor*
Blackbird, Yellow-headed	*Xanthocephalus xanthocephalus*
Bunting, Lark	*Calamospiza melanocorys*
Chicken, Attwater's Greater Prairie	*Tympanuchus cupido attwaterii*
Chicken, Domestic	*Gallus gallus*
Coot, American	*Fulica americana*
Coot, Hawaiian	*Fulica americana alai*
Cormorant species	*Phalacrocorax* species
Cormorant, Double-crested	*Phalacrocorax auritus*
Cowbird, Bronzed	*Molothrus aeneus*
Cowbird, Brown-headed	*Molothrus ater*

C Appendix

Crane, Mississippi Sandhill	*Grus canadensis pulla*
Crane, Sandhill	*Grus canadensis*
Crane, Whooping	*Grus americana*
Crow, American (common)	*Corvus brachyrhynchos*
Crow, Fish	*Corvus ossifragus*
Dove, Mourning	*Zenaida macroura*
Dove, Rock (feral pigeon)	*Columba livia*
Duck, Muscovy	*Cairina moschata*
Eagle, Bald	*Haliaeetus leucocephalus*
Eagle, Golden	*Aquila chrysaetos*
Eider, Common	*Somateria mollissima*
Egret, Cattle	*Bubulcus ibis*
Egret, Great	*Casmerodius albus*
Egret, Snowy	*Egretta thula*
Falcon	*Falco* species
Finch	Family Fringillidae
Goose, Canada	*Branta canadensis*
Goose, Snow	*Chen caerulescens*
Goose, Greater White-fronted	*Anser albifrons*
Goose, Aleutian Canada	*Branta canadensis leucopareia*
Goose, Hawaiian (Nene)	*Nesochen sandvicensis*
Grackle, Boat-tailed	*Quiscalus major*
Grackle, Common	*Quiscalus quiscula*
Grackle, Great-tailed	*Quiscalus mexicanus*
Grebe	Family Podieipedidae
Grebe, Horned	*Podiceps auritus*
Grebe, Pied-billed	*Podilymbus podiceps*
Grosbeak	Family Fringillidae
Grouse, Sage	*Centrocercus urophasianus*
Gull, Herring	*Larus argentatus*
Gull	*Larus* species
Hawk	Family Accipitridae
Hawk, Red-tailed	*Buteo jamaicensis*
Heron	Family Ardeidae
Heron, Black-crowned Night	*Nycticorax nycticorax*
Heron, Great Blue	*Ardea herodias*
Heron, Green-backed	*Butorides striatus*

Heron, Little Blue	*Egretta caerulea*
Kingfisher, Belted	*Ceryle alcyon*
Lark, Horned	*Eremophila alpestris*
Magpie, Black-billed	*Pica pica*
Mallard	*Anas platyrhynchos*
Mannikin, Nutmeg (ricebird)	*Lonchura punctulata*
Martin, Purple	*Progne subis*
Meadowlark, Eastern	*Sturnella magna*
Mockingbird, Northern	*Mimus polyglottos*
Owl, Common Barn	*Tyto alba*
Owl, Great Horned	*Bubo virginianus*
Owl, Snowy	*Nyctea scandiaca*
Owl	Families Tytonidae and Strigidae
Pelican, Brown	*Pelecanus occidentalis*
Pelican, American White	*Pelecanus erythrorhynchos*
Petrel	Families Procellariidae and Hydrobatidae
Pheasant, Ring-necked	*Phasianus colchicus*
Pigeon, Feral	*Columba* species
Ptarmigan, Rock	*Lagopus mutus*
Quail, Northern Bobwhite	*Colinus virginianus*
Quail	Family Phasianidae
Rail, Light-footed Clapper	*Rallus longirostris obsoletus*
Raven species	*Corvus* species
Roadrunner, Greater	*Geococcyx californianus*
Robin, American	*Turdus migratorius*
Sparrow	Families Emberizidae and Passeridae
Sparrow, House	*Passer domesticus*
Starling, European	*Sturnus vulgaris*
Stilt, Hawaiian	*Himantopus mexicanus knudseni*
Swallow	Family Hirundinidae
Swan	*Cygnus* species
Tern, California Least	*Sterna antillarum browni*
Tern, Roseate	*Sterna dougallii*
Thrasher, Pearly-eyed	*Margarops fuscatus*
Turkey (Domestic, Wild)	*Meleagris gallopavo*
Vireo, Black-capped	*Vireo atricapillus*
Vulture	Family Cathartidae

Vulture, Black	*Coragyps atratus*
Vulture, Turkey	*Cathartes aura*
Warbler, Kirtland's	*Dendroica kirtlandii*
Waxwing, Cedar	*Bombycilla cedrorum*
Woodpecker	Subfamily Picinae
Woodpecker, Pileated	*Dryocopus pileatus*

Amphibians and Reptiles

Alligator, American	*Alligator mississippiensis*
Lizard	Suborder Sauria
Rattlesnake	*Crotalus* species
Tortoise, desert	*Gopherus agassizii*
Turtle, sea	Family Cheloniidae
Turtle	Order Testudines
Turtle, snapping	Family Chelydridae

Other Species

Atlantic silversides	*Menidia menidia*
Bass	*Micropterus* species
Bluegill	*Lepomis macrochirus*
Catfish, channel	*Ictalurus punctatus*
Crayfish (crawfish)	*Procambarus clarkii*
Honeybee	*Apis mellifera*
Lobster, American	*Homarus americana*
Mussel, blue	*Mytilus edulis*
Oyster, Eastern	*Crassostrea virginica*
Pearlshell, Louisiana	*Margaritifera hembeli*
Shrimp	Family Pennaeidae
Salmon, Atlantic	*Salmo salar*
Salmon, coho	*Oncorhynchus kisutch*
Sunfish	Family Centrarchidae
Trout	Family Salmonidae

Appendix D

List of Preparers

Appendix D

List of Preparers

Butler-Manley, Barbara L.	USDA-APHIS-ADC-OSS Staff Secretary
Cairns, Miriam R.	Dames & Moore Staff Editor B.A., English, 1984 (Salisbury State University)
Chartrand, Allan	Dames & Moore Staff Project Environmental Toxicologist M.S.P.H., Environmental Toxicology, 1982 (University of California, Los Angles) B.S., Entomology/Pest Management, 1978 (University of California, Berkeley)
Cipu, Thomas A.	Dames & Moore Staff Economist B.S., Economics, 1981 (University of Maryland)
Connolly, Guy E.	USDA-APHIS-ADC, Wildlife Biologist, Denver Wildlife Research Center M.A., Biology, 1970 (California State University, Sonoma) B.S., Forest Conservation, 1961 (University of Montana)
Contreras, Glen P.	USDA Forest Service Wildlife Biologist, Wildlife Management Staff, M.S., Zoology, 1973 (University of Nevada) B.S., Agriculture, 1972 (University of Nevada)
Crowe, A. Samuel	USDA-APHIS-ADC-OSS, Staff Officer B.S., Biology, 1976 (University of New Mexico)
Dunaway, M. Alton	USDA-APHIS-ADC, Staff Biologist, Eastern Region M.S., Wildlife Ecology and Management, 1977 (Mississippi State University) B.S., Zoology, 1969 (University of Southern Mississippi)
Eastland, Warren G.	USDA-APHIS-BBEP Ph.D. Wildlife Management, 1991 (University of Alaska, Fairbanks) M.S. Wildlife Science, 1984 (Texas A&M University) B.S. Wildlife Resources, 1980 (University of Idaho)

Evangelou, Phylo	USDA-APHIS-PPD, Economist Ph.D., Agricultural Economics, 1984 (University of Florida) M.S., Agricultural Economics, 1978 (University of Nevada) M.Ed., Earth Sciences, 1976 (Penn State University) B.A., Social Sciences, 1972 (University of the Pacific)
Every, A. David	Dames & Moore Senior Terrestrial Ecologist Ph.D., Botany, 1977 (University of Washington) M.S., Botany, 1969 (University of Utah) B.S., Zoology, 1967 (University of Utah)
Fabiyi, Vicki O.	Dames & Moore Environmental Regulatory Analyst B.A., Political Science, 1987 (University of Maryland)
Green, Jeffrey S.	USDA-APHIS-ADC, Staff Specialist, Western Region Ph.D.,Wildlife and Range Resourses, 1978 (Brigham Young University) M.S., Zoology, 1976 (Brigham Young University) B.S., Zoology, 1971 (Brigham Young University)
Hale, Allan M.	Dames & Moore Senior Ecologist Ph.D., Plant Ecology, 1971 (University of Colorado) M.A., Radiation Biology, 1969 (University of Colorado) B.A., Biology, 1968 (Monmouth College)
Hanson, Todd	Dames & Moore Senior Environmental Analyst M.A., Sociology, 1975 (University of North Dakota) A.B., History, 1966 (University of Chicago)
Hettinger, Loren R.	Dames & Moore Senior Ecologist Ph.D., Plant Ecology, 1976 (University of Alberta) M.S., Plant Ecology, 1969 (New Mexico State University) B.S., Biology, 1967 (Fort Lewis College)
Lapidus, Gary A.	Private Contractor Desktop Publishing Services
Larson, Gary E.	USDA-APHIS-ADC, Director, ADC Operational Support Staff B.S., Wildlife Management, 1967 (University of Arizona)
Lewis, Barbara E.	Dames & Moore Project Economist M.S., Water Resources Management, 1984 (University of Wisconsin at Madison) B.A., Economics, 1978 (Colorado College)
Leighton, Ann M.	Environmental Analyst B.A., Biology, 1988 (University of Virginia)
Lowe, Sherry	USDA-APHIS-BBEP-EAD Writer-Editor

Maloney, M. David	Dames & Moore Senior Project Manager Ph.D., Physics, 1971 (Brown University) B.S., Physics and Mathematics, 1966 (Boston College)
McDavid, Catherine	Dames & Moore Senior Environmental Scientist M.S., Natural Resources Management, 1974 (Yale University) B.A., Sociology, 1970 (Barnard College)
McEwen, Gary M.	USDA-APHIS-ADC, District Supervisor, Texas Animal Damage Control Service B.S., Aquatic Biology, 1977 (Southwest Texas State University)
McMillen, Matthew C.	Dames & Moore Environmental Scientist M.S., Resource Development and Planning, 1982 (Michigan State University) B.S., Natural Resources and Environmental Sciences, 1979 (Michigan State University)
Mott, Donald F.	USDA-APHIS-ADC, Project Leader, Mississippi Research Station, Denver Wildlife Research Center B.S., Wildlife Management, 1967 (University of Arizona)
Owens, Rick D.	USDA-APHIS-ADC, Assistant Regional Director, Eastern Region M.S., Game Management, 1973 (Louisiana State University) B.S., Wildlife Conservation and Management, 1970 (Louisiana Tech University)
Pecoraro, Julie	Dames & Moore Staff Environmental Scientist M.S., Environmental Health-Technology, 1990 (University of Washington, Seattle) B.S., Chemistry, 1986 (Indiana University)
Penry, Linda B.	USDA-APHIS-ADC, Wildlife Biologist M.S., Biological Science, 1988 (Eastern Kentucky University) B.A., Biological Science, 1983 (University of Delaware)
Pizel, Robert E.	USDA-APHIS-BBEP, Branch Chief Environmental Analyses and Documentation Graduate Study, Wildlife Management (University of Idaho) B.S., Forestry, 1959 (University of Idaho)
Prasad, Surya S.	Dames & Moore Senior Soils Scientist Ph.D., Soil Science, 1977 (Rutgers University) M.A., Agriculture, 1971 (Sam Houston State University) B.S., Agriculture, 1969 (A.P. Agricultural University, India)

Salevan, James	Dames & Moore Environmental Scientist M.S., Marine Science, 1981 (North Carolina State University) B.S., Zoology, 1979 (North Carolina State University)
Seibert, Karen E.D.	Dames & Moore Environmental Scientist/Biologist B.A., Zoology and Environmental Sciences, 1983 (Ohio Wesleyan University)
Simmons, Gary D.	USDA-APHIS-ADC, State Director, Nevada B.S., Wildlife Ecology, 1971 (Oklahoma State University)
Slate, Dennis	USDA-APHIS-ADC, State Director, New Hampshire and Vermont Ph.D., Wildlife Ecology and Management, 1985 (Rutgers University) M.S., Wildlife Ecology and Management, 1978 (Rutgers University) B.S., Wildlife Sciences, 1974 (West Virginia University) A.A.S., Forestry, 1972 (Paul Smith's College)
Stathaeos, Charles J.D.	Dames & Moore Economist M.P.S., Agricultural Economics, 1983 (Cornell University) B.A., Anthropology, 1974 (University of Colorado)
Stenberg, Kathryn	Dames & Moore Wildlife Ecologist Ph.D., Wildlife Management, 1988 (University of Arizona at Tucson) M.A., Environmental Administration, 1982 (University of California at Riverside) B.A., Biology and Environmental Studies, 1980 (Whitman College)
Sumpter, Barbara J.	USDA-APHIS-ADC-DWRC Program Support Assistant
Travis, Richard K.	Dames & Moore Senior Economist M.A., Economic Geography, 1974 (University of Pittsburg) B.A., Physical Geography, 1967 (California State College)
Vo, Trang	USDA-APHIS-PPD, Supervisory Agricultural Economist Doctoral Program. 1985 - 1987, Agricultural and Resource Economics, (University of Maryland) M.S., Agricultural and Resource Economics, 1982 (University of Maryland B.A., Economics, 1978 (University of Maryland)
Wadleigh, Richard	USDA-APHIS-ADC, Environmental Manager B.S., Wildlife Ecology, 1971 (University of Arizona) B.A., Biology, 1966 (Beloit College)

Waters, Lewis (Buck)	USDI Bureau of Land Management, Pest Management Specialist, Division of Forestry M.A. Entomology, 1968 (University of Maine) B.S. Entomology, 1965 (Clemson University)
Wheeler, Allison W.	Dames & Moore Staff Biologist B.A., Biology, 1980 (Duke University)
Wickheiser, Vicki L.	USDA-APHIS-BBEP-EAD Writer-Editor
Wywialowski, Alice P.	USDA-APHIS-PPD, Senior Staff Wildlife Biologist Ph.D., Fisheries and Wildlife, 1985 (Utah State University) M.S., Wildlife Biology with minor in Sociology 1977 (Iowa State University) B.S., Game Management and Biology, 1975 (University of Wisconsin, Stevens Point)

Appendix E

Distribution List

Appendix E

Distribution List

Copies of this Draft Environmental Impact Statement (DEIS) have been provided for review and comment to the following individuals, agencies, or organizations:

United States Senators

Hon. Daniel K. Akaka, HI
Hon. Max Baucus, MT
Hon. Robert Bennett, UT
Hon. Joseph R. Biden, Jr., DE
Hon. Jeff Bingaman, NM
Hon. Christopher S. Bond, MO
Hon. David L. Boren, OK
Hon. Barbara Boxer, CA
Hon. Bill Bradley, NJ
Hon. John B. Breaux, LA
Hon. Hank Brown, CO
Hon. Richard H. Bryan, NV
Hon. Dale Bumpers, AR
Hon. Conrad Burns, MT
Hon. Robert C. Byrd, WV
Hon. Ben Nighthorse Campbell, CO
Hon. John H. Chafee, RI
Hon. Dan Coats, IN
Hon. Thad Cochran, MS
Hon. William S. Cohen, ME
Hon. Kent Conrad, ND
Hon. Paul Coverdell, GA
Hon. Larry E. Craig, ID
Hon. Alfonse D'Amato, NY
Hon. John C. Danforth, MO
Hon. Thomas A. Daschle, SD
Hon. Dennis DeConcini, AZ
Hon. Christopher J. Dodd, CT
Hon. Robert Dole, KS
Hon. Pete V. Domenici, NM
Hon. Byron L. Dorgan
Hon. Dave Durenberger, MN
Hon. James J. Exon
Hon. Lauch Faircloth, NC
Hon. Russ Feingold, WI
Hon. Dianne Feinstein, CA
Hon. Wendell H. Ford, KY
Hon. John Glenn, OH
Hon. Slade Gorton, WA
Hon. Bob Graham, FL
Hon. Phil Gramm, TX
Hon. Charles E. Grassley, IA
Hon. Judd Gregg, NH
Hon. Tom Harkin, IA
Hon. Orrin G. Hatch, UT
Hon. Mark O. Hatfield, OR
Hon. Howell Heflin, AL
Hon. Jesse Helms, NC
Hon. Ernest F. Hollings, SC
Hon. Jim M. Jeffords, VT
Hon. Bennett J. Johnston, LA
Hon. Nancy L Kassebaum, KS
Hon. Dirk Kempthorne, ID
Hon. Edward M. Kennedy, MA
Hon. Robert J. Kerrey, NE
Hon. John F. Kerry, MA
Hon. Herbert H. Kohl, WI
Hon. Robert Krueger, TX
Hon. Frank R. Lautenberg, NJ
Hon. Patrick J. Leahy, VT
Hon. Carl Levin, MI
Hon. Joseph I. Lieberman, CT
Hon. Trent Lott, MS
Hon. Richard G. Lugar, IN
Hon. Connie Mack, FL
Hon. Harlan Mathews, TN
Hon. John McCain, AZ
Hon. Mitch McConnell, KY
Hon. Howard M. Metzenbaum, OH
Hon. Barbara Mikulski, MD
Hon. George J. Mitchell, ME
Hon. Carol Moseley-Braun, IL
Hon. Daniel Patrick Moynihan, NY
Hon. Frank H. Murkowski, AK
Hon. Patty Murray, WA
Hon. Don Nickles
Hon. Sam Nunn, GA
Hon. Bob Packwood, OR
Hon. Claiborne Pell, RJ
Hon. Larry Pressler, SD
Hon. David Pryor, AR
Hon. Harry Reid, NV
Hon. Donald W. Riegle, Jr., MI
Hon. Charges S. Robb, VA
Hon. Jay Rockefeller, WV

Hon. Willian V. Roth, Jr., DE
Hon. Paul S. Sarbanes, MD
Hon. Jim Sasser, TN
Hon. Richard C. Shelby, AL
Hon. Paul Simon, IL
Hon. Alan K. Simpson, WY
Hon. Robert C. Smith, NH
Hon. Arlen Specter, PA
Hon. Red Stevens, AK
Hon. Strom Thumond, SC
Hon. Malcolm Wallop, WY
Hon. John W. Warner, VA
Hon. Paul Wellstone, MN
Hon. Harris Wofford, PA

United States Members of Congress

Hon. Robert A. Borski
Hon. William Clay, MO
Hon. C. Christopher Cox, CA
Hon. George Darden, GA
Hon. Kika De La Garza, TX
Hon. John J. Duncan, TN
Hon. Thomas S. Foley, WA
Hon. Benjaman A. Gilman, NY
Hon. Newt Gingrich, GA
Hon. Dan Glickman, KS
Hon. William F. Goodling, PA
Hon. Ralph M. Hall, TX
Hon. Lee H. Hamilton, IN
Hon. Amo Houghton, NY
Hon. Carroll Hubbard, Jr., KY
Hon. William J. Huges, NJ
Hon. Craig T. James, FL
Hon. Barbara B. Kennelly, CT
Hon. Jon Kyl, AZ
Hon. Jim Leach, IA
Hon. Jim Lightfoot, IA
Hon. Nita M. Lowey, NY
Hon. Ron Marlenee, MT
Hon. Alfred A. McCandless
Hon. Susan V. Molonari, NY
Hon. John P Murtha, PA
Hon. Donald J. Pease, OH
Hon. Bill Richardson, NM
Hon. Charles Rose, NC
Hon. David E. Skaggs, CO
Hon. Joe Skeen, NM
Hon. Ike Skelton, MO
Hon. Gene Taylor, MS
Hon. Robert S. Walker, PA
Hon. Jamie L. Whitten, MS
Hon. Chalmers P. Wylie, OH
Hon. Bill C.W. Young, FL

National Animal Damage Control Advisory Committee

Dr. James G. Butler, The Texas A&M University System
Dr. James L. Byford, School of Agriculture and Home Economics, University of Tennessee
Dr. Burton D. Cardwell
Dr. Keith A. Clark
Mr. Richard Colantuno
Mr. Jim W. Curran
Mr. David P. Dexter, Wildlife Legislative Fund of America
Ms. Dolly B. Echeverria
Mr. Charles H,. Fischer
Ms. Susan Hagood
Ms. Janice S. Henke
Ms. Cathy A. Liss
Ms. Marsha J. Lundgren
Dr. Steven Meredith
Mr. Steven W. Miller, Wisconsin Department of Natural Resources
Dr. W. Greg Nelson, Idaho Department of Agriculture
Mr. Vance H. Neuberger
Mr. Jw Nuckolls

Federal Agencies

U.S. Department of Agriculture
- Agricultural Research Service
- Animal and Plant Health Inspection Service
- Cooperative State Research Service
- Extension Service
- Farmers Home Administration
- Forest Service
- Soil Conservation Service

U.S. Department of Defense
- Department of the Air Force
- Department of the Army
- Department of the Navy

U.S. Department of Energy

U.S. Department of the Interior
- Bureau of Indian Affairs
- Bureau of Land Management
- Bureau of Reclamation
- Fish and Wildlife Service
- National Park Service

U.S. Department of Justice

U.S. Department of Transportation
- Federal Aviation Administration
- Federal Highway Administration

U.S. Environmental Protection Agency
Public Health Service

State Agencies

Departments of Agriculture for all States, Territories, and possessions
Departments of Wildlife, Natural Resources, or similar branches of government for all States, Territories, and possessions

Tribal Government

Navaho

Universities

Arkansas State University
Auburn University
Colorado State University
Cornell University
Eastern Kentucky University
Humboldt State University
Idaho State University
Iowa State University
Kansas State University
Louisiana State University
Michigan State University
Mississippi State University
Montana State University
New Mexico State University
New York State University
North Carolina State University
North Dakota State University
Ohio State University
Oklahoma State University
Oregon State University
Pennsylvania State University
Purdue University
Rutgers University
Southern Illinois University
South Dakota State University
Texas A&M University
Texas Tech University
Tufts University
University of Alaska
University of Arizona
University of California
University of Connecticut
University of Florida
University of Georgia
University of Idaho
University of Illinois
University of Maine
University of Maryland
University of Massachusetts
University of Minnesota
University of Missouri
University of Montana
University of Nebraska
University of Nevada
University of New Hampshire
University of North Dakota
University of Rhode Island
University of Tennessee
University of Vermont
University of Wisconsin
University of Wyoming
Utah State University
Virginia Polytechnic Institute and State University
Washington State University
West Virginia University

Organizations

Action For Animals
American Alfalfa Processors Association
American Angora Goat Association
American Association for Conservation Information
American Association of Nurserymen
American Dairy Goat Association
American Farm Bureau
American Farm Bureau Federation
American Fisheries Society
American Forest Institute
American Forestry Association
American Horticultural Association
American Institute of Biological Sciences
American Museum of Natural History
American Nature Study Society
American Ornithologists' Union
American Seed Trade Association
American Sheep Industry Association
American Society of Mammalogists
Animal Protection Institute of America
Animal Welfare Institute
Arizona League of Conservation Voters
Association of Interpretive Naturalists
Atlantic Salmon Federation
Audubon Society
Biodiversity Legal Foundation
Boone and Crockett Club
Bounty Information Service
California Farm Bureau Federation
California Cattlemen's Association
California Wool Growers Association
Carson Forest Watch
Colorado Cattle Feed Association
Colorado Wool Growers Association
Committee For Idaho's High Desert
Committee For Rational Predator Management
Conservation and Research Foundation
Defenders of Wildlife
Desert News

E Appendix

Ducks Unlimited, Inc.
Earth First Wolf Action Network
EG&G Energy Measurements
Environmental Action
Environmental Defense Fund, Inc.
Environmental Law Institute
Farm Bureaus
Friends of Animals
Friends of the Earth
Fur'n Feathers
Future Farmers of America
Good Shepherd Foundation
Greater Yellowstone Coalition
Humane Society
Idaho Cattle Association
Idaho Environmental Council
Idaho Wool Growers Association
Indiana Sheep Grower's Accociation
Industrial Forestry Association
International Apple Institute
International Association of Fish and Wildlife Agencies
International Crane Foundation
John Muir Institute of Environmental Studies
Kansas Fur Harvesters Association
Lake Campbell Wildlife Club
League of Conservation Voters
Livestock Conservation Institute
Millers National Federation
Mohair Council of America
Montana Stockgrowers Association
Mountain Lion Foundation
National Academy of Sciences
National Agricultural Chemicals Association
National Animal Damage Control Association
National Association of Conservation Districts
National Association of State Departments of Agriculture
National Association of State Land Grant Universities and Colleges
National Association of Wheat Growers
National Audubon Society
National Broiler Council
National Cattlemen's Association
National Corn Growers Association
National Environmental Health Association
National Farmers Organization
National Farmers Union
National Forest Products Association
National Geographic Society
National Institute for Urban Wildlife
National Parks and Conservation Association
National Pest Control Association
National Pork Producers Council
National Rice Growers Association
National Rifle Association of America
National Shooting Sports Foundation
National Sunflower Association
National Trappers Association, Inc.
National Turkey Federation
National Urban League
National Wild Turkey Federation
National Wildlife Federation
National Wildlife Refuge Association
Natural Grain Sorghum Producers Association
Natural Resources Council of America
Natural Resources Defense Council
North American Wildlife Foundation
Northwest Nuisance Wildlife Control
Oregon Natural Dessert Association
Oregon Sheep Growers Association
Outdoor Writers Association of America
Preservation League
Proctor Maple Research Center
Public Lands Action Network
Rachel Carsen Council
Raptor Research Foundation
Resources for the Future
Rest The West
San Diego Animal Advocates
Save The Wolf
Scientists Institute for Public Information
Sheep Industry Development Program
Sierra Club
Society of American Foresters
Society for Animal Protective Legislation
Society for Range Management
Society for the Preservation of Birds of Prey
Society of Toxicology
South Utah Wildlife Alliance
Texas and Southwestern Cattle Raisers
The Agricultural Group
The American Forestry Association
The American Humane Association
The Conservation Foundation
The Ecological Society of America
The Fund for Animals, Inc.
The Humane Society of the United States
The Izaak Walton League of America, Inc.
The National Grange
The Native Plant Sociatey of NM
The Nature Conservancy
The NorthCoast Environmental Association
The Wilderness Society
The Wildlife Legislative Fund of America
The Wildlife Society
Thorne Ecological Institute
United Fresh Fruit and Vegetable Association
United Pesticide Formulators and Distributors Association
U.S. Animal Health Association

Utah Wilderness Association
Utah Woolgrowers Association
Vermont Farm Bureau
Vermont Maple Sugar Makers Association
Welder Wildlife Foundation
Wildlife Damage Review
Wildlife Disease Association
Wildlife Legislative Council
Wildlife Management Institute
Wildlife Rescue of New Mexico
Wilson Ornithological Society

Private Individuals

Mr. James Van Abbena
Mr. Keith J. Andrews
Mr. David Anson
Mr. Johnny Ardis
Ms. Rebecca Ariens
Ms. Charlotte M. Armacost
Ms. D. Armentrout
Mr. William Armstrong
Ms. Sharon Bailey
Ms. Garetta Baird
Mr. Bill Baker
Ms. Fallicia Ballou
Mr. Lee Barcley
Mr. Kurt Baumgarten
Mr. Bruce Beans
H. Bebout
Mr. Sean Bechta
Mrs. Catherine Belanger
Mr. Bill Bennington
Mr. Richard Benton
Mr. Bob Berry
Kellyn Betts
C.J. Bishop
Ms. Judy Bishop
Mr. Kevin Bixby
Mr. Tom Blaine
Mr. Russell E. Blalack
Mr. John Bokman
Bonnie Bononeau
Cynthia Bostwich
Ms. Susan Brandes
Ms. Diane Brier
K.R. Brotherton
Mr. Thomas S. Budlong
Mr. David Burg
Mr. Jake Burnett
Mr. Bob Byrne
Jackie Cain
Mr. Paul Callahan
Mr. Franz Camenzind
Mr. Jack Campbell
Mr. Robert Campbell
Mr. Milton Caroline
Mr. Pete Carpenter
Mr. Dennis Carruth
Marian Cary
Mr. Dan Casali
Mr. Larry T. Caudill
Ms. Cara Chamberlain
Kathleen Chaplin
Mr. James D. Chapman
Mr. Ted Chu
Mr. Curt Clancy
Ms. Shirley Clark
Angie Coffin
Mr. Frank Cohen
D. Colclasure
Mr. Brian Cole
Ms. Kathy Coleman
Ms. Daisy Lee Collegde
Mr. Paul Connelly
Ms. Kelly Cranston
Mr. Vaughn Croteau
Mr. Jan A. Cummings
Ms. Lilliane Cummins
Mr. Dick Dana
Mr. Stuart Davidson
Mr. Carl Davis
Ms. Karen DeBraal
Mr. Ken DeBusk
Ms. Susan Dejmal
Ms. Diane Deleasa
Mr. Joe Demare
Mr. Tom Dennes
Ms. Cheryl Dillingham
Mr. Adam Doerr
Mr. Aaron Douglas
Mr. George Draffan
Mr. Charles Eirkson
Mr. Michael EK
Mr. Joe Ellis
Mr. Lloyd Emmons
Ms. Joan Enders
Ms. Carol Escott
Mr. Gordon Estes
Mr. Frank Estrada
Ms. Andra Ewton
Ms. Collete Feretti
Mr. Brent Fewell
Mr. Greg Filter
Mr. Bert Fingerhut
Ms. Cathe' Fish
Mr. Victor J. Flake
Mr. Robert Flandrena
Mr. Kevin Foerster

Mr. Anthony P. Foster
Mr. Dave Fredrick
Ms. Pat Freeman
Mr. Fred Fulstone
Mr. Phillip Furlow
Mr. Chris Garber
Mr. Steve Garber
Ms. Helen Gardiner
Ms. Diane Geeslin
Mr. Scott George
Ms. Judith Van Gieson
Mr. Bob Gilbert
Mr. Barry Gilman
Ms. Jill Goetz
Ms. Cecilia Goodrich
Mr. Greg Gordon
Ms. Judy Gould
Mr. Mike Graf
Mr. Gerald L. Grandel
T. Graves
Mr. Rodney Greeno
Mr. Michael Gregory
Ms. Janine Griess
Mr. Dick Hackett
Mr. Richard Hackett
Mr. Alan Hale
Mr. David Hale
Ms. Anna Halford
Ms. Jennifer D. Hall
J. P. Hancock
Mr. Lee Hansen
Ms. Kirsten Hardenbrook
Ms. Bonnie J. Hargroves
Mr. Dave Harlow
Mr. James G. Harris
Ms. Mavis Harris
Mr. Reid Harris
Ms. Terry Hauser
Ms. Kelly Hayes
Mr. Craig Heacock
Ms. Ruth Henderson
Ms. Janna Henke
Mr. Joyce Hewitt
Ms. Karen High
Ms. Lynn Hockenbury
Mr. Charles Howard
Mr. David M. Hutchens
Mr. Tom Hupf
Mr. James Irwin
Dr. William B. Jackson
R. Jacobsen
Ms. Susan C. Jacobson
Mr. Jerry Jayne
Ms. Connie Jedrzejewski
Ms. Lisa Jennings
Ms. Janet Johnson
Dr. Kathy Johnson
Mr. Steve Johnson
Ms. Vickki Johnson
Mr. David Jones
Mr. Paul Jones
Mr. Roy Jordan
Mr. Dennis Kaleta
Ms. Lucy Kaplan
Ms. Tanja Keogh
Mr. Ted Kerasote
Ms. Laurie Kintzele
Mr. Gary Kittleson
Mr. Rich Klicker
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Appendix F

Animal Damage Control "May Affect" Determinations for Federally Listed Threatened and Endangered Species, USFWS Biological Opinion

Appendix F

Animal Damage Control "May Affect" Determinations for Federally Listed Threatened and Endangered Species

"May Affect" Determinations

It has been determined that some activities of the Animal and Plant Health Inspection Service (APHIS) Animal Damage Control (ADC) program may affect federally listed threatened and endangered species in a positive or negative manner. APHIS ADC managers are aware that these potential "may affect" situations exist; therefore, it is the policy and practice of the program to conduct activities in a manner such that a negative impact on a listed species does not occur or is kept to an acceptable minimum.

Tables F-1 through F-7 list the potential impact that various APHIS ADC tools and methods may have on specified listed species. This listing is to provide the reader with the "may affect" determinations that were identified by APHIS ADC for inclusion in the formal programmatic Section 7 Consultation with the Department of Interior, U.S. Fish and Wildlife Service (USFWS). The Biological Opinion resulting from the consultation and other pertinent information is provided in this appendix.

The matrices are arranged phylogenetically (e.g., mammals, birds, reptiles, etc.) as listed in *Endangered & Threatened Wildlife and Plants,* 50 CFR 17.11 and 17.12. APHIS ADC methods have been arranged into two groupings: chemical methods and nonchemical methods. The tables are arranged to show the listed species being considered, the method being evaluated, and the target species the method is to control. In some cases, several species are grouped because of similarity of biology. Methods have been grouped when their impacts are similar. For example, several species of sea turtles are grouped together and the determination of "may affect" is listed as, "All methods that result in control of nest predators, mammalian and/or avian, would be positive."

This analysis does not attempt to evaluate the "may affect" determination on the habitat manipulation method. Habitat manipulation is too variable to evaluate at the programmatic level (see p. 2-24 for a partial list of a wide variety of habitat manipulation methods). In circumstances where habitat manipulation is to be accomplished and a "may affect" determination is made, a specific Section 7 Consultation will be requested by APHIS ADC.

These matrices do not include proposed species or proposed critical habitat. Federal agencies are mandated by the Endangered Species Act (ESA) of 1973 to evaluate whether or not their proposed actions are likely to jeopardize any proposed species or adversely modify

proposed critical habitat. If such a determination is made, the agency is required to request a "conference" with the USFWS. To date, no such conference has been warranted. APHIS ADC will continue to examine its program to ensure that future actions are conducted in a manner consistent with the intent of the ESA.

In Tables F-1 through F-7 some species show both positive and negative "may affect" determinations. For example, the second cell for Jaguarundi and Ocelot in Table F-2 reads: LT, CY, +, –. This indicates that leghold traps, when used for the control of coyotes, have the potential for both positive and negative impacts on the two species of cats. A positive effect could result from the reduction of predation by coyotes on the cats. Positive effects also could result from reducing competition between coyotes and the cats for food. A negative impact could result if a listed cat was accidentally caught in a leghold trap. It is APHIS ADC policy not to use leghold traps for coyote control in areas likely to be occupied by either of the cat species. However, if leghold traps are to be used in areas adjacent to known or possible cat habitats, tension devices would be used to minimize the chances of taking a listed cat. Trap tension devices prevent animals smaller than targeted animals from accidentally being caught by increasing the weight required to spring the trap.

Biological Opinion

Based on the request for consultation that included the "may effect" determinations for 144 animal and plant species, APHIS reinitiated formal consultation with USFWS. The USFWS concluded that only a few of these species would have potential negative impacts from the APHIS ADC Program. The consultation was then narrowed to seven mammals, eight birds, five reptiles, and one amphibian.

On July 28, 1992, the USFWS issued a Biological Opinion on the APHIS ADC Program. This document details the USFWS opinion on the entire APHIS ADC national program and its potential impacts on federally listed threatened or endangered species and their critical habitats.

The remainder of this Appendix contains: (1) a copy of the "Dear Interested Citizen" letter summarizing and explaining the contents of the biological opinion; (2) the APHIS ADC program's letter of intent to adopt the reasonable and prudent alternatives presented in the biological opinion; and (3) the complete USFWS Biological Opinion.

Table F-1

Possible Effects of APHIS ADC Chemical Control Methods on Listed Mammals

Listed Species	Method,[a] Target Species,[b] Possible Effects[c]				
Bear, grizzly	SC, CY –	ST, GP –	ST, SQ –	TC, CY –	
Deer, Columbian white-tailed	SC, CY +				
Ferret, black-footed	AP, PD –	GC, PD –	SC, CY +	ZP, PD –	
Jaguarundi and Ocelot	ST, AB –	ST, AR –	SC, CY +, –		
Mouse, Alabama beach, Perdido Key beach, Choctawhatchee beach, and salt marsh harvest	AP, AR –	AP, AR –	ST, AR –	ZP, AR –	
Prairie dog, Utah	GC, CY +	SC, CY +	(d)		
Rat, Fresno kangaroo, giant kangaroo, and Morro Bay kangaroo	(d)				
Squirrel, Mt. Graham red	ST, SQ –	ZP, MS –			
Vole, Hualapai Mexican	(d)				
Wolf, gray, Mexican, and red	SC, CY +, –	ST, AR –	ST, MM –	ST, RB –	TC, CY +, –

[a] Chemical methods:
- AP = aluminum phosphide
- CP = CPT liquid
- GC = gas cartridge
- SC = sodium cyanide
- ST = strychnine
- TC = 1080 toxic collar
- ZP = zinc phosphide

[b] Target species:
- AB = any bird
- AR = any rodent
- BL = blackbird
- CY = coyote
- PD = prairie dog
- GP = gopher
- MM = marmot
- MS = mouse
- RB = rabbit
- RT = rat
- RV = raven
- SQ = squirrel

[c] Possible effect:
- \+ = positive
- – = negative

[d] Toxicant rodent control would have a potential for negative effects.

F Appendix

Table F-2

Possible Effects of APHIS ADC Nonchemical Control Methods on Listed Mammals

Listed Species	Method,[a] Target Species,[b] Possible Effects[c]								
Bat, gray	PB, BT +								
Bat, Indiana	PB, BT +								
Bat, Ozark big-eared and Virginia big-eared	PB, BT –								
Bear, grizzly	LT, CY –	SN, BB –	SN, CY –						
Caribou, woodland	DE, CY +	LT, CY +, –	SH, CY +	SN, CY +, –					
Cougar, Eastern	LT, CY –	SN, CY –							
Deer, Columbian white-tail	DE, CY +	LT, CY +, –	SH, CY +	SN, CY +, –					
Ferret, black-footed	DE, CY +	LT, CY +, –	SH, CY +	SN, CY +					
Fox, San Joaquin kit	CT, FX +, –	CT, RC +, –	CT, SK +, –	DE, CY +	LT, BC +, –	LT, BD +, –	LT, CY +, –	SH, CY +	SH, SK +
Jaguarundi and Ocelot	LT, BC +, –	LT, CY +, –	LT, FX +, –	SN, BC +, –	SN, CY +, –	SN, FX +, –			
Mouse, Alabama beach and Perdido Key beach	CT, FC +	DE, FX +	LT, FC +	LT, FX +	SH, FC +	SH, FX +			
Prairie dog, Utah	DE, CY +	LT, CY +, –	SH, CY +	SN, CY +					
Pronghorn, Sonoran	DE, CY +	LT, CY +, –	SH, CY +, –	SN, CY +					
Squirrel, Carolina northern flying, Delmarva fox, and Virginia northern flying	CT, SQ +								
Wolf, gray, Mexican, and red	LT, BV –	LT, RC –	LT, WF +	SN, WF +, –	(d)				

[a] Nonchemical methods:

- CT = cage trap
- DE = denning
- LT = leghold trap
- PB = physical barrier (includes fencing, electric fencing)
- SH = shooting (includes aerial hunting, calling and spotlighting, and use of dogs)
- SN = snares (neck and foot)

[b] Target species:

- BB = black bear
- BC = bobcat
- BD = badger
- BT = bat
- BV = beaver
- CY = coyote
- FC = feral cat
- FX = fox (gray/red)
- RC = raccoon
- SK = skunk
- SQ = squirrel (ground)
- WF = wolf

[c] Possible effect:

- \+ = positive
- – = negative

[d] Any predator control will have a potential for both positive and negative effects.

Table F-3

Possible Effects of APHIS ADC Chemical Control Methods on Listed Birds

Listed Species	Method,[a] Target Species,[b] Possible Effects[c]							
Blackbird, yellow-shouldered	DR, BL +, –	AV, BL +, –						
Bobwhite, masked	DR, BL –	ST, PI –	ST, AR –	ZP, AR –				
Condor, California	GC, CY +	SC, CY +, –						
Crane, whooping and Mississippi sandhill	DR, RV, +, –	GC, CY +	GC, FX +	SC, CY +, –	ST, AB –	ST, AR –	TC, CY +	ZP, AR –
Curlew, Eskimo	DR, GU +	GC, CY +	GC, FX +	SC, CY +				
Duck, Laysan	AC, RT +	ZP, RT +						
Eagle, bald	AV, AB –	DR, AB –	SC, CY +	ST, AR –	ST, RB –	TC, CY +, –	TP, AB –	ZP, AR –
Falcon, peregrine and northern aplomado	AV, BL –	AV, GU –	AV, PI –	DR, AB –	OR, PI –	ST, AB –	TP, AB –	
Finch, Laysan and Nihoa	AC, RT +, –	ZP, RT +, –	ST, AB –	AV, AB –				
Goose, Aleutian Canada	TC, FX +	AC, RT +, –	DR, RV +	SC, CY +	SC, FX +	ST, SQ –	ZP, RT +, –	ZP, SQ –
Hawaiian: coot, crow, drepanids, duck, goose, hawk, stilt	(d)							
Millerbird, Nihoa	AC, RT +	ZP, RT +						
Moorhen, Hawaiian common	(d)							
Pelican, brown	SC, CY +	GC, CY +	TC, CY +					
Petrel, Hawaiian dark-rumped	(d)							
Pigeon, Puerto Rican plain	(d)							
Plover, piping	(d)							
Prairie chicken, Attwater's greater	(d)							
Rail, light-footed clapper	ST, MS –							
Shearwater, Newell's	(d)							
Tern, California least, least, and roseate	(d)							
Thrush, large Kauai, Molokai, and small Kauai	(d)							

[a] Chemical methods:
AC = anticoagulant
AV = avitrol
DR = DRC-1339
GC = gas cartridge
OR = ornitrol
SC = sodium cyanide
ST = strychnine
TC = 1080 toxic collar and 1080 SDB (4 mg)
TP = Toxperch
ZP = zinc phosphide

[b] Target species:
AB = any bird
AR = any rodent
BL = blackbird
CY = coyote
FX = fox (red and arctic)
GU = gull
MG = mongoose
MM = marmot
MS = mouse
PI = pigeon
RB = rabbit
RT = rat (includes Norway)
RV = raven
SP = sparrow
SQ = squirrel
SR = starling
TH = thrasher
VO = vole

[c] Possible effect: + = positive – = negative

[d] Control of any nest predator is a positive impact.

Note: Use of strychnine and zinc phosphide have a potential negative impact if the listed species feeds on the target species.

Table F-4

Possible Effects of APHIS ADC Nonchemical Control Methods on Listed Birds

Listed Species	Method,[a] Target Species,[b] Possible Effects[c]										
Blackbird, yellow-shouldered	CT, BL +, –	SD, BL –									
Condor, California	DE, CY +	LT, BC +, –	LT, BD +, –	LT, CY +, –	QT, BV +	SN, BB +	SH, BV +	SH, CY +	SH, SK +	SN, CY +	
Coot, Hawaiian	NT, NH +	SH, CE +	SH, NH +								
Crane, Mississippi sandhill and whooping	LT, CY +, –	LT, RC +, –	QT, BV +, –	SD, AB –							
Crow, Hawaiian	CT, PG +	PB, PG +	SH, PG +	SN, PG +							
Curlew, Eskimo	PT, OW +	SD, BL –	SD, GU +, –	SH, GU +							
Drepanids, Hawaiian	CT, PG +	PB, PG +	SH, PG +	SN, PG +							
Duck, Hawaiian	NT, NH +	SH, CE +	SH, NH +								
Duck, Laysan	CT, RT +	ST, RT +									
Eagle, bald	LT, BC +, –	LT, BV +, –	LT, CY +, –	LT, EG +, –	LT, FX +, –	LT, RC +, –	NT, AB –	RT, EG +, –	RT, RP +, –	SD, AB –	SH, CY +, –
	SD, WT –	SH, BV –	SH, CM +, –	SD, EG +	SH, RP –	SN, BB +	SN, CY +	SN, WF +	QT, BV +, –	WG, GU –	
Falcon, peregrine	PT, RP –	RT, PF +, –	RT, RP –	SD, AB –	SD, PF +	WG, GU –					
Finch, Laysan	CT, RT +	ST, RT +									
Finch, Nihoa	CT, RT +	ST, RT +									
Goose, Aleutian Canada	BC, FX +	DE, FX +	LT, CY +, –	LT, FX +, –	SD, WT +, –	SH, FX +	SN, CY +	WG, GU –			
Goose, Hawaiian	SH, CE +										
Honeycreepers and finches	SH, PG +										
Millerbird, Nihoa	CT, RT +	ST, RT +									
Moorhen, Hawaiian common	NT, NH +	SH, CE +	SH, NH +								
Nightjar, whippoorwill	SH, MG +	CT, MG +	QT, MG +	LT, MG +							
Parrot, Puerto Rican	SH, TH +	CT, TH +									
Pelican, brown	(d)										
Pigeon, Puerto Rican plain	PB, RT +	SH, RT +	CT, RT +	ST, RT +							
Plover, piping	SD, BL –	PT, OW +									
Prairie chicken, Attwater's greater	(d)										
Rail, light-footed clapper	(d)										

(Continued)

Table F-4 (Continued)

Possible Effects of APHIS ADC Nonchemical Control Methods on Listed Birds

Listed Species	Method,[a] Target Species,[b] Possible Effects[c]						
Shearwater, Newell's	SH, PG, +	PB, PG +	SN, PG +				
Stilt, Hawaiian	NT, NH +	SH, CE +	SH, NH +				
Stork, wood	PB, AB +, –	PB, WS +	SD, AB +	SD, WS +	SH, AB +, –	TE, AB +, –	WG, AB +, –
Tern, California least, least, and roseate	CT, FC +	RT, RP +	PT, OW +	SD, BL –			
Thrush, large Kauai, Molokai, and small Kauai	SH, PG +	PB, PG +	SN, PG +	CT, PG +			
Vireo, black-capped	SD, BL –	SD, CE –					
Woodpecker, red cockaded	SH, BV +	SN, BV +	QT, BV +	LT, BV +			

[a] Nonchemical methods:
- BC = biocontrol (neutered animal)
- CT = cage trap
- DE = denning
- LT = leghold trap
- NT = netting or mistnet
- OT = Other trap (includes nonraptor and mole)
- PB = physical barrier
- PT = pole trap
- QT = Conibear (quick-kill) trap
- RT = raptor trap
- SD = scaring devices and harassment (includes sonic devices, exploders, scarecrows, distress and alarm calls, pyrotechnics, lights, etc.)
- SN = snares (neck and foot)
- SH = shooting (includes aerial hunting, calling, spotlighting, and use of dogs)
- ST = snap trap
- TE = tetroon
- WG = wire grid

[b] Target species:
- AB = any bird
- AR = any rodent
- BB = black bear
- BC = bobcat
- BD = badger
- BL = blackbird
- BV = beaver
- CE = (cattle) egret
- CM = cormorant
- CY = coyote
- EG = eagle (golden)
- FC = feral cat
- FX = fox (includes red and arctic)
- GU = gull
- HA = hawk (includes goshawk)
- MG = mongoose
- ML = mountain lion
- NH = black-crowned night heron
- OW = owl
- PF = peregrine falcon
- PG = pig
- RC = raccoon
- RP = raptor
- RT = rat (includes Norway)
- RV = raven
- SK = skunk
- TH = thrasher
- WF = wolf
- WS = wood stork
- WT = waterfowl

[c] Possible effect:
- \+ = positive
- – = negative

[d] The control of any nest predator will have a positive effect.

Table F-5

Possible Effects of APHIS ADC Chemical Control Methods on Listed Reptiles and Amphibians

Listed Species	Method,[a] Target Species,[b] Possible Effects[c]			
Reptiles				
Boa, Mona	TO, RT +			
Gecko, Monito	TO, RT +			
Iguana, Mona ground	TO, RT +			
Snake, Eastern indigo	AP, AR –	GC, CY –	GC, FX –	GC, WC –
Tortoise, desert	DR, RV +	GC, CY +	SC, CY +	
Tortoise, gopher	AP, AR –	GC, CY +	GC, FX +	GC, AR –
Turtle, Alabama red-bellied	DR, CR +			
Turtle, flattened musk	DR, CR +			
Sea turtle, green, hawksbill, Kemps ridley, leatherback, and loggerhead	(d)			
Amphibian				
Toad, Wyoming	ST, AR –			

+

[a] Chemical methods:
- AP = aluminum phosphide
- DR = DRC-1339
- GC = gas cartridge
- SC = sodium cyanide
- ST = strychnine
- TO = toxicant

[b] Target species:
- AR = any rodent
- CR = crow
- CY = coyote
- FX = fox
- RT = rat
- RV = raven
- WC = woodchuck

[c] Possible effect:
- \+ = positive
- – = negative

[d] All methods that result in control of mammalian and/or avian nest predators would be positive.

Table F-6

Possible Effects of APHIS ADC Nonchemical Control Methods on Listed Reptiles

Listed Species	Method,[a] Target Species,[b] Possible Effects[c]						
Alligator, American	CP, AL +, –	EX, BV –	SN, BV –	QT, BV –	LT, BV –		
Boa, Mona	SH, PG +	SN, PG +	CT, MG +	QT, MG +, –	LT, MG +	ST, RT +	
Gecko, Monito	CT, RT +	ST, RT +					
Iguana, Mona ground	PB, PG +	SH, PG +	SN, PG +	CT, PG +			
Tortoise, desert	SH, CY +	DE, CY +	SN, CY +	LT, CY +, –	SH, RV +		
Turtle, Alabama red-bellied	SD, CR +	LT, RC +	CT, RC +	QT, BV –	QT, MR –	QT, RC +, –	QT, NU –
Turtle, flattened musk	SD, CR +	LT, RC +	CT, RC +	QT, BV –	QT, MR –	QT, RC +, –	QT, NU –
Sea turtle, green, hawksbill, Kemps ridley, leatherback, and loggerhead	(d)						
Turtle, ringed sawback	LT, RC +						

[a] Nonchemical methods:
- CP = catch pole
- CT = cage trap
- DE = denning
- EX = explosives
- LT = leghold trap
- PB = physical barrier
- QT = Conibear (quick-kill) trap
- SD = scaring devices and harassment (includes use of scarecrows)
- SH = shooting
- SN = snare
- ST = snap trap

[b] Target species:
- AL = alligator
- BV = beaver
- CR = crow
- CY = coyote
- MG = mongoose
- MR = muskrat
- NU = nutria
- PG = pig
- RC = raccoon
- RT = rat
- RV = raven

[c] Possible effect:
- + = positive
- – = negative

[d] All methods that result in control of mammalian and/or avian nest predators would be positive.

Table F-7

Possible Effects of APHIS ADC Control Methods on Listed Fish, Snails, Clams, Crustaceans, and Plants

Listed Species	Chemical Methods	Nonchemical Methods
Fish	(a)	(c)
Snail	(a)	(c)
Clam	(a)	(d)
Crustacean	(a)	(d)
Plant	(b)	(e)

Chemical methods:

[a] Any use of PA-14 in blackbird control can have a potential negative impact.

[b] Any use of PA-14 in blackbird control can have a potential for both positive and negative impacts.

Nonchemical methods:

[c] Any use of explosives in beaver control would have a potential for both positive and negative impacts. All other forms of beaver control would be positive.

[d] Any nonchemical beaver control has a positive impact.

[e] Any nonchemical beaver control can have a potential for both positive and negative impacts.

Dear Interested Citizen:

We are pleased to provide you with a copy of the Biological Opinion we received from the United States Fish and Wildlife Service (FWS) on July 28, 1992. The document gives the FWS's opinion on the entire Animal Damage Control (ADC) national program as to how it may potentially impact federally listed threatened and endangered species.

The Biological Opinion shows that the ADC Program is very safe in its operations relative to threatened and endangered species in the United States. Out of the 728 species listed by the FWS, twenty-one species have been identified as potentially being affected by the ADC program. Only eight of those twenty-one species require ADC operational adjustments to avoid jeopardy to the species or its habitat. ADC has agreed to completely follow all of the recommended adjustments in the Biological Opinion. The majority of the adjustments were being implemented before receiving the Biological Opinion.

All Biological Opinions have certain terms and concepts in them that have specific connotations to the Endangered Species Act. The following definitions may clarify questions that people have when reading this document.

Jeopardy- A jeopardy opinion refers to an expression by the FWS biologist that if certain precautions are not taken by the program, a species or population could be adversely impacted by proposed actions and that these **might** jeopardize the continued existence of that species or populations. The opinion also states that if ADC follows the recommended actions the species will not be jeopardized by the program and adverse impacts will be minimal.

Incidental Take- Incidental take numbers are an estimate by the FWS of the number of individual animals of the listed species expected to be accidentally taken even if recommended measures are followed. A low "incidental take" number indicates that actions are very safe as long as the recommendations are applied.

Reasonable and Prudent Alternatives- Reasonable and prudent alternatives are the recommended actions to prevent "jeopardizing the continued existence" of any species.

Reasonable and Prudent Measures- Reasonable and prudent measures are the recommendations to be followed to reduce the amount of incidental take of the species in question. If the reasonable and prudent measures are followed and the incidental take is exceeded then the two Agencies (APHIS and FWS) simply reinitiate consultation on that species to discuss if new measures need to be taken or if the incidental take number needs to be raised.

If you have further questions or desire more information after reading this document, contact William L. Thomas, APHIS-ADC, Staff Officer, (301) 436-8281.

Sincerely,

R L Wadleigh

Richard L. Wadleigh
Acting Director
Operational Support Staff
Animal Damage Control

August 6, 1992

Mr. John F. Turner
Director
Fish and Wildlife Service
U.S. Department of the Interior
Washington, DC 20240

Dear Mr. Turner:

This is to acknowledge your biological opinion of July 28, 1992, regarding the potential impact of the Animal Damage Control (ADC) program on federally listed threatened and endangered species. In accordance with interagency regulation, 50 CFR, Part 402, this letter is to inform you that the ADC program will adopt the Reasonable and Prudent Alternatives as identified in the biological opinion.

Thank you for your review of the program.

Sincerely,

/s/ Bobby R. Acord

Bobby R. Acord
Deputy Administrator
Animal Damage Control

APHIS:ADC:BClay:car:720-2054:8/6/92:turner6

United States Department of the Interior

FISH AND WILDLIFE SERVICE
WASHINGTON, D.C. 20240

ADDRESS ONLY THE DIRECTOR
FISH AND WILDLIFE SERVICE

In Reply Refer To:
FWS/FWE/DES

JUL 28 1992

Mr. Robert Melland
Animal & Plant Health Inspection Service
U.S. Department of Agriculture
P.O. Box 96464
Washington, D.C. 20090-6464

Dear Mr. Melland:

This responds to Mr. James Glosser's March 15, 1990, request for reinitiation of the February 28, 1979, formal consultation with the United States Department of Agriculture (USDA) on its Animal Damage Control (ADC) Program as required under Section 7 of the Endangered Species Act of 1973. This consultation supersedes that initial consultation which was completed when ADC was part of the U.S. Fish and Wildlife Service (Service).

CONSULTATION HISTORY

In the intervening years since the February 1979 consultation, there have been substantial changes in the Endangered Species Act. There have also been a number of consultations with the U.S. Environmental Protection Agency (EPA) on registration of chemicals used by the ADC Program and several consultations with USDA on certain specific elements of the ADC Program itself. The Section 7 regulations now require the Service to issue Incidental Take Statements for unintended taking that may occur pursuant to the otherwise legal activities conducted subsequent to a consultation. This biological opinion provides incidental take levels for certain species along with reasonable and prudent measures to minimize or eliminate such take. Since reinitiation, the consultation period was formally extended for 60 days in July of 1990, and informally several times by mutual agreement between Service and USDA staff members. A consultation team of Regional representatives was appointed to draft the opinion. A preliminary draft was sent to the team members for input on April 19, 1991. Three drafts were prepared and circulated for formal Regional and USDA comment August 15, 1991; March 17, 1992; and a final draft on May 22, 1992.

An April 11, 1988, order of the U.S. District Court for the District of Minnesota enjoined any registrations of the aboveground uses of strychnine. However, according to the EPA's Office of General Counsel and the Department of the Interior Solicitor, the current court action does not prevent an agency from seeking formal consultation nor prohibit the Service from issuing a biological opinion pertaining to strychnine. Thus, the Service is thus treating strychnine use as if the injunction has been lifted.

PROPOSED ACTIONS

The proposed actions considered in this consultation include the operational, research, and technical assistance phases of the ADC Program as described in the document entitled "Compliance with Section 7 Endangered Species Act of 1973, as amended." In the operational phase, ADC personnel carry out the control work; in the research phase, ADC personnel conduct research to improve wildlife damage control methods and techniques; and in the technical assistance phase, personnel other than ADC personnel conduct the control work. Technical assistance is carried out as defined in Appendix B of the Draft Environmental Impact Statement (DEIS) issued in July 1990 on the ADC Program. Examples of ADC technical assistance include, but are not limited to, providing items such as chemicals and equipment as well as providing verbal or written advice, recommendations, information, demonstrations, and training in management of wildlife damage programs. All of the methods described below are used in the conduct of the program.

ANIMAL DAMAGE CONTROL METHODS

ADC employs a number of control tools and techniques discussed below, both chemical and non-chemical, in the implementation of its programs. These tools and techniques are diverse, situation-specific, and variable in scope, ranging from nonlethal measures to lethal control.

Cultural Practices

Cultural methods include a variety of practices that can be employed by agricultural producers to reduce resource exposure to wildlife depredation and loss. Implementation of these practices is appropriate when the potential for depredation can be reduced without significantly increasing the cost of production or diminishing the resource owner's ability to achieve land management and production goals. ADC recommends changes in cultural practices when a change of this type appears to represent a means of averting losses.

Animal Husbandry - This general category includes modifications in the level of care and attention given to livestock, shifts in the timing of breeding and births, altering the selection of resource to be produced, and the introduction of livestock custodians (e.g., herders, guard dogs) to protect livestock.

Crop Selection and Planting Schedules - The choice of crops and time of planting often has a direct bearing on the potential for losses to depredation. In some cases the time of planting can be adjusted to reduce or eliminate the availability of vulnerable crops to migratory wildlife species, and some crops are less prone to predation.

Lure Crops - Lure crops are planted or set aside for wildlife as an alternative food source to reduce the effect of depredation. To be successful, frightening techniques may be required also in the field being protected.

Habitat Modifications

Habitat modifications can restrict the access of wildlife or render the habitat less hospitable to wildlife. Habitat modifications used or recommended by ADC program are described below.

Physical Barriers - Several mechanical methods such as fences, netting, metal flashing, and spiked metal strips are advocated for suppression of damage to livestock, crops, buildings and facilities by birds and mammals. Two forms of physical barriers used to protect fish from foraging birds are: complete enclosures of ponds and raceways with screen or net, and partial enclosure using overhead wires, lines, net, or screen.

Habitat Management and Biological Control - Habitat can sometimes be managed not to support or attract certain wildlife species. Most of the habitat management application in the ADC program involves airport health and safety work, blackbird/starling winter roost problems, or orchards/field crop depredation complaints.

Aversive Tactics

Aversive tactics alter the behavior of the target animal to the extent that the potential for loss or damage to the property by this animal is greatly reduced or eliminated. Scaring and harassment are some of the oldest methods of combatting animal damage, and continue to be effective.

I. Nonchemical

Electronic Distress Sounds - Distress and alarm calls of various animals have been used independently and in conjunction with other scare devices to successfully scare or harass animals.

Gas Exploders - Gas exploders operate on acetylene or propane gas and are designed to scare the offending wildlife by producing loud explosions at controllable intervals. The exploders are placed around the problem site in areas known to receive heavy damage.

Pyrotechnics - Shell crackers or scare cartridges are 12-gauge shotgun shells containing a firecracker. Noise bombs, whistle bombs, racket bombs, and rocket bombs are fired from hand-held launch guns. Noise bombs, or bird bombs, are firecrackers that travel about 75 feet before exploding. A variety of other pyrotechnic devices, including firecrackers, rockets, and Roman candles are used for dispersing animals.

Effigies, Scarecrows, and Other Scaring Techniques - Owl decoys, reflective Mylar tape, and helium-filled balloons are used as scaring devices. Their effectiveness is enhanced when they are used in conjunction with auditory scare devices. Other devices such as scarecrows, ribbons, flagging, suspended pie plans, etc., are also used in animal damage control activities.

Lights - A variety of lights, including strobe, barricade, and revolving units have been used to frighten birds.

Water Spray Devices - Water spray from rotating sprinklers placed at strategic locations in or around ponds or raceways will repel certain birds, particularly gulls.

II. Chemical

Chemical Repellents - Repellents are compounds which prevent use of an area or consumption of food item resources. Repellents operate by producing an undesirable taste, odor, feel, or behavior pattern. The avian frightening agent Avitrol (4-Aminopyridine) is limited for use in specific areas and for protection of specific crops. Avitrol is a toxic chemical, but is used as an area repellent by limiting the treated bait particles through dilution. Use sites are monitored to assure bait consumption is by targeted species only.

Population Management

Many capture methods employed by the ADC program can be used as either lethal or nonlethal methods depending on the management objective. When the objective is a scientific collection or relocation, or if the animal captured is a nontarget, it can be released. If the captured animal is a target species and the object is population reduction in the local area, the animal is euthanized.

A. Nonlethal

Leghold Traps - Leghold traps are frequently used to capture animals such as coyote, bobcat, fox, mink, beaver, raccoon, skunk, muskrat, nutria, and mountain lion. These traps are the most versatile and widely used tool available to ADC for capturing many species.

Cage Traps - Cage traps were often used where lethal or more controversial tools would be inappropriate due to a potential hazard to pets, other wildlife, or humans. Cage traps are well suited for use in residential areas. These traps are used to capture animals ranging in size from mice to deer, but are generally impractical in capturing most large animals.

Snares - Snares, made of wire or cable, are among the oldest existing control tools. Snares can be used effectively to catch most species but are most frequently used within ADC to capture coyotes, beaver, and bears. Snares may be lethal or nonlethal.

Pole Traps - Pole traps can be effectively used to capture raptors (i.e., hawks and owls) because of their behavioral tendency to perch prior to making a kill. One to several poles, 5 to 10 feet high, are erected near the area where depredations are occurring. A padded-jaw, leghold trap (usually size 1-1/2) is set on the top of each pole. A steel wire is passed

through the trap chain and attached at both the top and base of the pole, to allow the bird to come to rest on the ground after being captured.

B. Lethal

1. Nonchemical

Leghold Traps - When the target animal is captured, the animal is generally euthanized. The method of euthanasia varies, but it is ADC policy to provide the quickest, most painless death possible to the animal.

Quick-kill Traps - A number of "quick-kill" traps are used in animal damage control work. They include Conibear-type, snap, gopher, and mole traps. The Conibear-type trap consists of a pair of rectangular wire rod frames attached on both sides, which close in a scissor-like fashion when triggered, killing the captured animal with a quick body blow. The larger size of the Conibear trap (i.e., #330) is restricted in ADC to use in shallow water or underwater and primarily to capture nutria and beaver. The smaller sizes (i.e., #220, #115, #110) can be used in aquatic situations to capture nutria or muskrat, but are also used in dry land sets for trapping skunks, weasels, rats, and armadillos.

Snap traps (i.e., rat and mouse traps) are used to collect and identify rodent species that are causing damage, so that species-specific control tools can be applied.

Mole traps are used to control surface-tunneling moles (i.e., Nash moletrap and harpoon trap). Soil is pressed down in the active tunnel and the trap is placed with the trigger against the compressed area. When the mole re-opens the tunnel, the trap is triggered.

Gopher traps (e.g., Macabee gopher trap) are placed in burrows to control pocket gophers. These traps are set in active burrows and are selective to the animal targeted.

Shooting

Ground Hunting - Lethal reinforcement is often necessary to ensure the continued success in bird scaring and harassment efforts.

Shooting is an integral facet of predator control. Trap-wise coyotes, while difficult to trap, are often vulnerable to calling. Shooting can be selective for offending individuals and has the advantage that it can be directed at specific damage situations.

Aerial Hunting - Shooting from aircraft is a commonly used coyote damage control method. Aerial hunting is species-selective and can be used for immediate control where livestock losses are severe, providing weather, terrain, and cover conditions are favorable. Aerial hunting can be effective in removing offending coyotes which have become "trap-wise" and/or are not susceptible to calling and shooting.

Hunting Dogs - Dogs are essential to successful hunting of mountain lion and bear. Dogs trained for coyote denning are also valuable in luring offending coyote adults within shooting distance.

Denning - Denning is the practice of seeking out the dens of depredating coyotes or red fox and eliminating the young, adults, or both to stop ongoing and/or prevent further depredations on livestock. Denning is used primarily in the Western States. The usefulness of denning as a damage control method is proven, however, since locating dens is difficult and time consuming, and den use is restricted to approximately 2 to 3 months of the year, its practical use is limited.

2. Chemicals

a. Toxicants

Several toxic chemicals have been developed for use in the control of animal damage. Because of their efficiency, such toxicants have been widely employed. Since toxicants are generally not species-specific, and their use may pose a hazard to some nontarget species.

The following section describes the chemicals used in the current ADC program:

Zinc Phosphide - Zinc phosphide is a metallic toxicant used as a rodenticide.

Sodium Cyanide - Sodium cyanide is used in the M-44, a spring-activated ejector device developed specifically to take coyotes and other canine predators. The M-44 device consists of a capsule holder which is wrapped with fur, cloth, or wool; a spring-powered ejector mechanism; a capsule containing approximately 0.1 grams of powdered sodium cyanide (plus inert ingredients); and a 5 or 7 inch hollow stake.

Sodium cyanide is a fast-acting toxicant that, upon contact with moisture, either rapidly breaks down or is quickly metabolized. When sodium cyanide contacts water it quickly hydrolyses into hydrocyanic gas and sodium hydroxide. Cyanide which is ingested, kills the animal and is protein-bound, rendering it harmless to other animals that might scavenge the carcass.

Strychnine - Strychnine is a white, crystalline, bitter-tasting toxicant. It is very toxic to most mammals and birds, with the exception of gallinaceous birds which are relatively resistant. Strychnine is often retained in the gut of the consuming animal and consequently may pose a secondary hazard to scavengers. ADC currently restricts normal program use of strychnine to field rodent and nuisance bird control efforts. Strychnine is not used as a predacide except in emergency situations involving human health and safety.

Strychnine-treated grain is used in the control of damage caused by a variety of field rodents. When used as a field rodenticide, strychnine-treated milo or oats are thinly scattered in or near the rodent's den, burrow, or area where damage is occurring.

Anticoagulants - Several anticoagulant rodenticides are used to control commensal rodents and some field rodents. Common anticoagulants include warfarin, diphacinone, and chlorophacinone. Anticoagulants were originally multiple-dose toxicants (i.e., several feedings were required to achieve a lethal dose), however some recent formulations require only a single feeding to be effective.

DRC-1339 - DRC-1339 is a chemical used to control starlings and blackbirds in and around cattle and hog feedlots and poultry yards. This chemical is highly toxic to starlings, generally less toxic to other birds, and relatively nontoxic to most mammals. There is minimal danger to raptors or to mammalian carnivores that might eat DRC-1339 poisoned starlings since hawks and mammals are resistant to DRC-1339. DRC-1339 causes most birds to die at the roosting site.

Compound 1080 - Currently, the only registered, non-experimental, use of this chemical in controlling predators is as the active ingredient in the Livestock Protection Collar.

b. Fumigants

Gas Cartridges - Fumigants or gases are used to control burrowing wildlife. In the ADC program, fumigants are only used in rodent burrows and in predator dens. The ADC program manufactures and uses den and burrow cartridges specifically formulated for both of the above-stated purposes. These cartridges are hand placed in the active burrow or den of the target animal, and the entrance is tightly sealed with soil. The burning cartridge causes death from a combination of oxygen depletion and carbon monoxide poisoning.

Aluminum phosphide - Aluminum phosphide tablets are used as a fumigant in the control of prairie dogs.

c. Stressing Agents

PA-14 - The avian stressing agent PA-14 is the only chemical registered for control of roosting blackbirds and starlings during the winter months. PA-14 is a surfactant that lowers the surface tension of water. When PA-14 solution is sprayed on birds, the chemical action of the surfactant breaks down the feathers' natural waterproofing characteristics. Feathers become soaked and matted from the PA-14 solution and lose the insulating value. When applied during low temperatures, and if the birds are sufficiently wetted, insulation loss cannot be offset by increased metabolism, and the treated birds' body temperature eventually drops to the lethal level.

In the past, the Service has conducted numerous informal and formal consultations on specific ADC projects to consider the possible effects of those projects on endangered and threatened species in a particular geographic area. This process will continue in any instance where Service, ADC or other Federal agency personnel identify possible adverse impacts to threatened or endangered species.

One major objective of this consultation is to provide for closer routine coordination between USDA and the Service on Section 7 responsibilities. Toward this end, the Service will provide information on newly listed species and will review possible impacts of new and existing control techniques. In return, ADC personnel will keep the Service up-to-date on program changes, new techniques and non-target losses.

FORMAT

"May effect" determinations have been made for 22 species. The opinion will address each of those individually with status information, effects of the proposed action, and biological opinion with reasonable and prudent alternatives as appropriate.

An incidental take statement follows the biological opinion, with its reasonable and prudent measures and implementing terms and conditions, as appropriate. Sections 4(d) and 9 of the Act, as amended, prohibit taking (harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct) of listed species of fish or wildlife without a special exemption. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering. Harass is defined as actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Under the terms of §7(b)(4) and §7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered a prohibited taking provided that such taking is in compliance with the terms and conditions of this incidental take statement. The measures described in the incidental take statement are nondiscretionary, and must be implemented by the agency so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, in order for the exemption in §7(o)(2) to apply.

The Federal agency has a continuing duty to regulate the activity that is covered by the incidental take statement. If the agency fails to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of §7(o)(2) may lapse.

The biological evaluation submitted by USDA contained 144 species (Enclosure 1).

SPECIES NOT LIKELY TO BE ADVERSELY AFFECTED

The Service does not believe that any of the following species will be adversely affected by any aspect of the ADC Program:

Mammals

1. Listed bats: Ozark and Virginia big-eared, gray, and Indiana. Habitat modifications mentioned in the evaluation are so minor in nature that the Service has determined 'no affect'.

2. Ungulates: Columbian white-tailed deer and woodland caribou. Although ADC suggested that leghold traps and neck snares may affect these two cervids, the Service is unaware of any such occurrences in the past. The limited overlap between the ranges of the species and the area of operational ADC activity further reduces the likelihood of exposure.

3. Sonoran pronghorn: There have been no ADC activities in the range of this species since 1968. Any new activity may require consultation at that time.

4. Eastern cougar: This subspecies is believed to be extirpated.

5. Florida panther: The panther occurs outside the operational area of the ADC program. Leghold traps or snares are not recommended by ADC within the species' range.

6. Northern flying squirrels: The high country distribution of these squirrels in Virginia and North Carolina results in little opportunity for exposure. In addition, ADC does not use or recommend rodenticides within the species' ranges.

7. Delmarva fox squirrel: There is virtually no field rodent control conducted in the range of the fox squirrel and, ADC would not recommend use of toxicants within the species' range.

8. Red wolf: Limited distribution in the wild (eastern North Carolina) precludes the likelihood of exposure. If further releases are successful, it will be necessary to review ADC activities to insure continued protection.

9. Mt. Graham red squirrel: ADC does not use or recommend toxicants within the species' limited range.

10. Hualapai vole: ADC does not use or recommend toxicants within the species' limited range.

11. Listed mice: Alabama beach mouse, Anastacia Island beach mouse, Choctowatchee beach mouse, Perdido Key beach mouse, Key Largo cotton mouse, southeastern beach mouse, salt marsh harvest mouse. ADC does not use or recommend toxicants within these species' ranges.

12. Other listed rodents: Fresno kangaroo rat, Morro Bay kangaroo rat, Tipton kangaroo rat, giant kangaroo rat, Key Largo woodrat. ADC does not use or recommend rodenticides within these species' ranges.

Birds

13. Masked bobwhite: ADC does not use or recommend use of chemicals within the limited range of this species.

14. Puerto Rican species: Puerto Rican nightjar, Puerto Rican parrot, Puerto Rican plain pigeon and yellow-shouldered blackbird. There is no registered use for zinc phosphide, strychnine, DRC-1339 or avitrol in Puerto Rico.

15. Brown pelican: Pelicans nest and feed in estuarine and marine habitats, so there is no opportunity for exposure.

16. Pacific Island birds: Hawaiian common moorhen, Hawaiian coot, Hawaiian duck, Hawaiian goose, Hawaiian stilt, Newell's Townsend's shearwater, large Kauai thrush, small Kauai thrush, Molokai thrush, Laysan finch, Nihoa finch, and Nihoa millerbird. ADC does not use or recommend use of toxicants in areas where these species might be exposed to them.

17. California least tern and California clapper rail: Impact would likely be beneficial for predator control for skunks, raccoons and red foxes.

18. Eskimo curlew: Species is so rare, if it exists at all, that neither adverse nor beneficial impact is anticipated.

19. Interior least tern: Species aquatic feeding habits preclude exposure.

20. Light-footed clapper rail: Species aquatic feeding habits and wetland habitat preference preclude the likelihood of exposure.

21. Piping plover: Impacts would likely be beneficial as gull control could reduce competition for nesting space.

22. Black-capped vireo: Impacts would likely be beneficial as control of cowbirds would reduce nest paracitism.

23. Roseate tern: Impacts would likely be beneficial as gull control could reduce competition for nesting space.

24. Wood stork: Aquatic feeding habits preclude the likelihood of exposure.

Reptiles

25. Alabama red-bellied turtle and flattened musk turtle: The red-bellied turtle is an herbivore and the musk turtle feeds on mollusks. Thus,

the feeding habits of the turtles preclude the likelihood of exposure to toxicants.

26. American crocodile and American alligator: The limited range of the American crocodile (extreme southern Florida) and habitat preference (saltwater estuaries) preclude likelihood of exposure to any aspect of the ADC Program. The American alligator is listed only as similar in appearance in order to protect the American crocodile.

27. Sea turtles - green, loggerhead, leatherback, Kemp's ridley and hawksbill: Control activities to protect turtle nests from predation would be beneficial.

28. Mona boa, Mona ground iguana, and Monito gecko: No toxicants are registered for use in Puerto Rico. Other predator control activities are beneficial.

29. Fish, clams, crustaceans, and plants: ADC evaluation describes possible impacts from use of PA-14 on bird roosts with subsequent runoff of this material. The Service does not believe this will occur. The low toxicity of these toxicants, combined with the unlikely possibility of much material getting into aquatic habitat, minimizes the chances of exposure.

AFFECTED SPECIES

The Service concurs with ADC that the following threatened or endangered species will be adversely affected by some aspect of the ADC Program:

BLACK-FOOTED FERRET (*Mustela nigripes*) - E

BIOLOGICAL OPINION

Status of the species

The black-footed ferret is a large, buckskin-colored weasel with black face mask, black tipped tail and black feet, and can weigh up to 3 pounds. They depend upon prairie dogs for both food and shelter and have never been found where prairie dogs do not exist. Today, at least partly due to the extensive prairie dog poisoning campaigns of the 1930's, the black-footed ferret is one of the rarest native mammals in North America.

Since the turn of the century, the ferret's habitat (prairie dog colonies) decreased by as much as 95 percent, primarily as a result of land-use changes and practices that include prairie dog control (Choate et al. 1982, Anderson et al. 1986, Flath and Clark 1986). From over 100 million acres in the late 1800's, prairie dog colonies are estimated to be reduced to about 2 million acres; only a portion of which may be suitable for ferret survival and recovery.

The last known wild black-footed ferrets were found in Meeteetse, Wyoming, but this species once ranged from the great plains of Canada to intermontane regions of the interior Rocky Mountains and Southwest.

The likelihood of other populations of ferrets being found in the wild is considered low, and if some remain, the probability of their continued survival and viability in the wild for long periods of time is considered low by population biologists. However, the occurrence of ferrets within the historic range of the species must still be considered possible by the Service.

There are currently nearly 300 captive ferrets managed cooperatively by the Wyoming Game and Fish Department and the Fish and Wildlife Service in facilities at: Wyoming Game and Fish Department's Sybille Wildlife Research and Conservation Education Unit, Wheatland, Wyoming; Henry Doorly Zoo in Omaha, Nebraska; and the Conservation and Research Center near Front Royal, Virginia; the Louisville Zoological Park in Louisville, Kentucky; and the Cheyenne Mountain Zoo in Colorado Springs, Colorado; the Phoenix Zoo in Arizona; and Toronto Metropolitan Zoo, Canada. In the spring of 1991, forty-nine ferrets were released in the Shirley Basin, Wyoming. As of November, 1991, ten or fewer were considered likely to be alive. The Service, States, and other Federal agencies have begun to identify prairie dog complexes approximately 10,000 acres in size and of sufficient quality to be considered for ferret reintroductions. This requires mapping prairie dog colonies in each State and selecting complexes of prairie dog colonies to evaluate and rank nationally for reintroductions of black-footed ferrets. Once the final sites have been selected, areas considered not suitable for recovery of the species can be cleared by the Service under the proposed "Block Clearance" Program and, after review, can be removed from areas with currently recommended control restrictions.

Effects of the Proposed Action

Appendix F of the DEIS on the ADC Program identifies a potential adverse impact on the black-footed ferret from the use of aluminum phosphide, gas cartridges, and zinc phosphide to control prairie dogs, and leghold traps to control coyotes. Appendix F also identifies a potential positive impact for ferrets from the use of M-44s and leghold traps for coyote control. ADC personnel believe that if coyotes and other predators are controlled, there will be less chance of their killing a ferret or prairie dog, the ferret's primary food source, although coyotes probably would not kill enough prairie dogs to negatively affect black-footed ferret numbers. Predator control (primarily of coyotes) in and around prairie dog towns also would decrease the possibility of introducing diseases which may negatively impact black-footed ferrets.

The DEIS states that the preferred prairie dog control tool in areas where ferrets may exist is zinc phosphide rather than strychnine grain baits. Use of zinc phosphide in areas where ferrets may exist would occur only after ferret surveys were conducted and no evidence of ferrets was found. The DEIS also states that any impact on ferrets from the loss or reduction of the availability of prey is speculative.

Primary and secondary poisoning of ferrets combined with the cumulative impact of control programs on their primary habitat (prairie dog colonies) will have an adverse impact on the survival and recovery of this species. As prairie dog colonies become smaller and their spacing more distant, it can be theorized that ferret populations would suffer the following consequences: (1) reduced gene flow; (2) decreased ability to disperse to new colonies; and (3) lowered mating success.

BIOLOGICAL OPINION

Even with ferret surveys and successful reproduction in captivity, the survival and recovery of the species is unlikely with a large annual rate of habitat loss. Loss of a single black-footed ferret in the wild would constitute jeopardy to the species. It is, therefore, my biological opinion that those components of the ADC Program described above are likely to jeopardize the continued existence of the black-footed ferret, because of the possible mortality that could result.

REASONABLE AND PRUDENT ALTERNATIVES

The Section 7 regulations have defined reasonable and prudent alternatives as alternative actions, identified during formal consultation, that can be implemented in a manner consistent with intended purpose of the action, that can be implemented consistent with the scope of the Federal agency's legal authority and jurisdiction, that are economically and technologically feasible, and that the Service believes would avoid the likelihood of jeopardizing the continued existence of listed species or result in the destruction or adverse modification of critical habitat.

The reasonable and prudent alternative to preclude jeopardy during prairie dog control is for ADC personnel to 1) work with the States, landowner, and/or land agency to map prairie dog colonies in the vicinity of each colony that is proposed for control, and 2) ensure that prairie dog control shall not occur in any prairie dog complex larger than 1,000 acres, unless the area has been block cleared by the Service's block clearance process. A prairie dog complex consists of two or more neighboring prairie dog towns, each less than 7 kilometers (4.34 miles) from each other. Once the area of proposed action is mapped, the following criteria shall be applied to preclude jeopardy to the black-footed ferret as a result of the use of toxicants by ADC personnel:

1. A black-tailed prairie dog colony or complex of less than 80 acres having no neighboring black-tailed prairie dog towns may be treated without a ferret survey. A midrange of 102 acres (61 to 294 acres) of occupied black-tailed prairie dog habitat is believed necessary to support a single ferret, so it is highly unlikely that a ferret would be found in an isolated colony of less than 80 acres. A neighboring prairie dog town is defined as a colony less than 7 kilometers from the town to be treated, based on the longest distance that the ferret has been observed to travel during the night (Biggins et al. 1985, Richardson et al. 1987).

2. A white-tailed prairie dog colony or complex of less than 200 acres having no neighboring white-tailed prairie dog towns may be treated without a survey. It is estimated to require between 196 and 475 acres of white-tailed prairie dogs to support a single ferret.

3. Urban situations (e.g., playgrounds, golf courses, etc.) may be treated without conducting ferret surveys. The appropriate Service office should be contacted in advance of any treatment to determine whether an "urban situation" exists.

4. For black-tailed prairie dog colonies or complexes over 80 acres but less than 1,000 acres, and white-tailed prairie dog colonies or complexes over 200 acres but less than 1,000 acres, prairie dog control may be allowed after completing a black-footed ferret survey within 30 days of proposed treatments provided no ferrets or their sign are found. If all colonies in the complex are surveyed without sign of ferrets, no future survey for ferrets would be required. These surveys will be coordinated with the appropriate Service office.

5., For prairie dog complexes over 1,000 acres, no control shall be allowed until the complex has been evaluated by appropriate State and/or Federal agencies (those agencies participating on State working groups for ferret recovery) for its potential as a recovery site and until the complex has been block cleared. One thousand acres would be a minimum complex size for consideration as a black-footed ferret reintroduction site and would likely require intensive management of habitat for a ferret population (USFWS 1988). The Black-footed Ferret Recovery Plan calls for the establishment of at least 10 populations with no fewer than 30 breeding adults in each population by the year 2020.

6. ADC personnel shall maintain records of the number of acres of prairie dog towns or complexes controlled and the type of chemicals used for the control. These records shall be provided to the Service and EPA on an annual basis.

7. Surveys should be supervised by biologists trained in ferret survey techniques and ferret biology at a Service-approved training workshop. Currently, only the University of Wyoming conducts such a course. Ferret surveys should be reviewed by the Service for compliance with survey standards and Section 7 of the Endangered Species Act. The Service will work with ADC personnel to determine or evaluate the possibilities of developing a core in-house training program for ADC personnel to ensure that proper and appropriate ferret surveys are carried out.

Because the Service finds jeopardy to the ferret, the Agency is required to notify the Service of its final decision whether the reasonable and prudent alternative will be implemented.

INCIDENTAL TAKE STATEMENT

Assuming the implementation of the reasonable and prudent alternatives described above, the Service does not anticipate that the proposed action will result in any incidental take of the black-footed ferret.

GRIZZLY BEAR (Ursus arctos horribilis) - T

BIOLOGICAL OPINION

Status of the Species

Grizzly bear populations in the conterminous United States are restricted to northcentral and northeastern Washington, northern and eastern Idaho, western Montana, and northwestern Wyoming. Only six areas are known to sustain either self-perpetuating or remnant populations, excluding southern Colorado, where a grizzly bear was killed in the fall of 1979 in a remote section of the San Juan National Forest. These areas include the Yellowstone Grizzly Bear Ecosystem (YGBE), the Northern Continental Divide Grizzly Bear Ecosystem (NCDGBE), the Cabinet-Yaak Grizzly Bear Ecosystem (CYGBE), the Selkirk Mountains Grizzly Bear Ecosystem (SMGBE), the Selway-Bitterroot Grizzly Bear Ecosystem (SBGBE), and the North Cascades Grizzly Bear Ecosystem (NCGBE).

The primary components of the grizzly bear habitat include food, cover, and denning habitat. Grizzly bears are successful omnivores, and in some areas may be entirely herbivorous. Grizzly bears must avail themselves of large quantities of food in order to survive denning and post-denning periods. They are opportunistic feeders and will prey or scavenge on almost any available food including ground squirrels, ungulates, carrion, and garbage. This search for food is a prime influence on movements. Upon emergence from

the den, they seek the lower elevations, drainage bottoms, avalanche chutes, and ungulate winter ranges, where their food requirements can be met.

Limited reproductive capacity of grizzly bears precludes any rapid increase in the population. Mating appears to occur from late May through mid-July, with a peak in mid-June. The age of first reproduction and litter size varies and may be related to the nutritional state of the bear. Litter sizes range from 1 to 4 with the mean of about 2.

The current population of grizzly bears is estimated at between 800 and 1,000 bears (USFWS 1982a). The YGBE population is estimated between 200 and 350, while the NCGBE population is believed to be between 440 and 680 bears (USFWS 1982a). In the US, the CYGBE population is estimated at less than 15 individuals. The decline in the bear populations has been related to habitat loss and indirect human-caused mortality. Most of the actions adversely impacting the grizzly bear occur on Federal lands. Some non-Federal actions that would adversely impact the grizzly bear include habitat destruction and direct human-caused mortality (e.g., both legal and illegal shooting of bears) on private lands.

Effects of the Proposed Action

Secondary poisoning of grizzly bears by aboveground use of strychnine baits is possible if enough rodent carcasses containing strychnine are consumed following rodent control. In an April 1, 1980, biological opinion, the Service concluded that below ground use of strychnine-treated grain for pocket gopher control was not likely to jeopardize the continued existence of the grizzly bear. Aboveground use of strychnine is presently prevented by a court injunction issued April 11, 1988. Further action is required by the EPA before the injunction can be lifted.

In Montana, Columbian ground squirrel control using strychnine baits may occur in or adjacent to grizzly recovery areas if the court injunction is lifted. Aboveground use of strychnine inside grizzly recovery areas in Wyoming and eastern Idaho (Yellowstone ecosystem) would be low since the recovery area is primarily on public lands where aboveground use of strychnine would be restricted to case-by-case evaluations by the Forest Service or National Park Service and/or used below ground in conifer plantations for pocket gophers.

Existing label restrictions (prior to the injunction) prohibit the aboveground use of strychnine baits in the geographic range of the grizzly bear except under programs and procedures specifically approved by the EPA. Where feasible, the user is required to pick up and burn or bury all visible carcasses of ground squirrels in or near treated areas. The aboveground use of strychnine for porcupine control is specifically prohibited in areas known to be occupied by the grizzly bear and lastly, the user is advised by label to contact the Service or State fish and game office for specific information on the presence of endangered species.

The M-44 is capable of killing a grizzly bear if a grizzly bear pulls the M-44 and receives sodium cyanide orally. Grizzly bears might kill sheep or lambs wearing 1080 collars or feed on carrion of dead collared sheep. Although compound 1080 is highly toxic to some warm blooded animals, there is no information on the toxicity of compound 1080 to grizzly bears. There is a reported LD50 for other bears of 0.5 to 1.0 mg/kg, suggesting that both a large collar (60 ml) and a small collar (30 ml) could be toxic to even a large grizzly bear.

ADC Program policy is not to use M-44s or toxic collars containing compound 1080 in areas occupied by grizzlies. In addition, the EPA label use restrictions on M-44s state that these devices shall not be used in areas where federally listed threatened and endangered species might be adversely affected. Label restrictions for the 1080 livestock protection collar also require the Service to be contacted prior to its possible use in certain areas of Idaho, Montana, Washington, and Wyoming. If it is determined by the Service or the user that the use of the collar may adversely affect a grizzly bear, the collar cannot be used in those specific areas.

The ADC Program includes the live capture of grizzly bears (in accordance with the Interagency Grizzly Bear Guidelines) and other species with leghold traps, cage traps, foot snares, and tranquilizing drugs/guns. In some cases, a problem bear that meets the criteria for removal outlined in the Interagency Grizzly Bear Guidelines may have to be killed. Grizzly bears also may be caught in traps set for other species (e.g., coyote and wolf). Capture of a grizzly in any of these devices could result in injury or death to the bear. A grizzly bear cub could be caught and held by a leghold trap or a snare set for coyotes. However, a review of 20 years of Montana data indicates no non-target grizzly bear has been taken by traps or snares. An adult or juvenile grizzly bear could be killed in a neck snare set to capture a coyote, black bear, or mountain lion. Grizzly bears also have been accidentally killed from overdoses of drugs while attempting relocation. Based on past records, loss of a non-target grizzly bear appears to be rare. In our review of ADC records and other data compiled on grizzly bear mortality for all ecosystems, there has been no accidental mortality of non-target grizzly bears during the past five years as a result of the ADC Program.

BIOLOGICAL OPINION

It is my biological opinion that the ADC Program is not likely to jeopardize the continued existence of the grizzly bear, except for the Cabinet-Yak Grizzly Bear Ecosystem, where take of one bear would represent joepardy to that recovery unit.

REASONABLE AND PRUDENT ALTERNATIVES - CYGBE Recovery Unit

The Section 7 regulations have defined reasonable and prudent alternatives as alternative actions, identified during formal consultation, that can be implemented in a manner consistent with intended purpose of the action, that can be implemented consistent with the scope of the Federal agency's legal

authority and jurisdiction, that are economically and technologically feasible, and that the Service believes would avoid the likelihood of jeopardizing the continued existence of listed species or result in the destruction or adverse modification of critical habitat.

The reasonable and prudent alternative necessary to preclude jeopardy to this recovery unit is:

1. All cage (culvert) traps and foot snares set for black bears in areas occupied by grizzly bears shall be checked at least once a day;

2. Neck snares (for coyotes) without break-away locks shall not be used in areas occupied by grizzly bears; and

3. Neck snares shall not be used for black bears or mountain lions in areas occupied by grizzly bears.

INCIDENTAL TAKE STATEMENT

There is the possibility of incidental take of grizzly bears as a result of leghold traps, snares (legs and neck), and use of tranquilizing guns. Records show eight grizzly bears have been accidentally killed in the last five-year period by various agencies while capturing and handling grizzlies. Due to the potential to accidently kill a grizzly bear during legitimate control operations, the anticipated level of incidental take as a result of the ADC Program is one grizzly bear in Wyoming and the Northern Continental Divide area (ecosystem) of Montana. Any incidental take should be reported within 5 working days to the Helena Field Office, U.S. Fish and Wildlife Service, P.O. Box 10023, Federal Building & U.S. Courthouse, 301 S. Park, Room 494, Helena, Montana 59626-0023.

The Service has determined that this level of impact is not likely to result in jeopardy to the species, except that no take can be authorized for the CYGBE recovery unit, as take of one bear would represent jeopardy to that recovery unit.

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize incidental take of the grizzly bear:

1. ADC personnel shall take all precautions possible to reduce any possible incidental take, including training on the use of drugs for animal immobilization and restraint.

2. ADC personnel shall monitor incidental take to ensure compliance with anticipated take levels.

Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, the USDA must comply with the following terms and conditions, which implement the reasonable and prudent measures described above.

1. All cage (culvert) traps and foot snares set for black bears in areas occupied by grizzly bears shall be checked at least once a day.

2. Neck snares (for coyotes) without break-away locks shall not be used in areas occupied by grizzly bears.

3. Neck snares shall not be used for black bears or mountain lions in areas occupied by grizzly bears.

4. The Service Fish and Wildlife Enhancement Office, in the Regions of the species occurrence, should be notified within 5 days of the finding of any dead or injured grizzly bears in or adjacent to an ADC Program work area. Cause of death, injury, or illness, if known, also should be conveyed to those offices.

GRAY WOLF (Canis lupus) - E
Minnesota - T

BIOLOGICAL OPINION

Status of the Species

The gray wolf inhabits the northeastern third of Minnesota, portions of the northern third of Wisconsin, and portions of the Upper Peninsula and Isle Royale of Michigan (USFWS 1992). The gray wolf also occurs, as a result of ongoing natural recolonization, in Idaho, north-central Washington, and northwestern Montana. Successful reproduction of wolves has been recorded in southeast British Columbia, Canada, along the North Fork of the Flathead River, Glacier National Park, and other areas in northwest Montana, and the north Cascades of Washington.

The key components of wolf habitat include: (1) a sufficient, year-around prey base of ungulates and alternate prey, (2) suitable and somewhat secluded denning and rendezvous sites, and (3) sufficient space with minimal exposure to humans. The primary prey for wolves in Minnesota, Wisconsin, and Michigan include deer, moose, and beaver. Wolves in the Rocky Mountains feed on elk, bison, ground squirrels, snowshoe hare, and grouse. On a biomass basis, ungulates comprise the bulk (more than 90 percent) of the wolves' diet during summer and fall in the Rocky Mountains.

In the Northern Rockies, wolf pups are born any time from late March to late April or possibly early may. Most wolves appear particularly sensitive to human activity near den sites and may abandon them if disturbed. Critical

Habitat for the northeastern population comprises 9,845 square miles in Beltrami, Itasca, Koochiching, Lake, Lake of the Woods, Roseau, and St. Louis Counties, Minnesota, and Isle Royal National Park in Michigan.

As of March 1991, the wolf population in and adjacent to Montana is estimated to be about 50 wolves in 5 packs. No more than 15 wolves were believed to be present in central Idaho as of August 1987. There are no recent population figures for the gray wolf (eastern timber wolf) but it is estimated that there are approximately 1,200 to 1,300 of these wolves occurring in Minnesota, Wisconsin, and Michigan. The population decline of the easter timber wolf was a result of (1) intensive human settlement, (2) direct conflict with domestic livestock, (3) a lack of understanding of the animal's ecology and habits, (4) fears and superstitions concerning wolves, and (5) the extreme control programs designed to eradicate the wolf (Young and Goldman 1944). These same factors apply to the decline in all wolf populations in the United States. Reasons for the decline of the Northern Rocky Mountain wolf also are given as land development, loss of habitat, poisoning, trapping, and hunting. Non-Federal actions adversely impacting the wolf primarily include hunting and trapping of wolves on non-Federal lands.

Effects of the Proposed Action

According to the DEIS on the ADC Program, the use of M-44s to control coyotes, the aboveground use of strychnine to control rodents and rabbits, and the 1080 toxic collar to control coyotes could adversely affect the gray wolf. In addition, leghold traps for beaver, raccoon, and problem wolves and coyotes, and neck snares to control problem wolves and coyotes also may affect the gray wolf. An accidental shooting of a wolf while hunting coyotes is an extremely remote possibility because wolves are distinguishable from the air, and because ADC uses trained and experienced gunners in areas where wolves are known or suspected, but such incidents have occurred. Wolf relocation will occasionally cause the accidental death of or injury to wolves (e.g., accidental overdose of drugs while tranquilizing wolves, or injury from traps).

The Service believes that the Interim Wolf Control Plan (Plan) approved in August 1988, will promote the conservation of the species. The Plan, amended in December 1989, now includes Idaho, Montana, Wyoming and northeast Washington. Control plans are nearing completion for North and South Dakota and Washington. A Federal or State agency or Indian Tribe that has a permit from the Service under Section 10 of the Endangered Species Act may conduct wolf control actions in accordance with the Plan. These control actions include: (1) capturing problem wolves on public or private lands and relocating them to remote areas of public lands; (2) placing problem wolves in captivity; or (3) killing problem wolves. Verbal approval followed by written authorization from the Service is required prior to killing a wolf.

The Northern Rocky Mountain Wolf Recovery Plan clearly states that efficient and professional control of problem wolves will promote conservation of the

species (USFWS 1987). The Service developed the Interim Wolf Control Plan and authorized (permitted) ADC personnel to conduct wolf control in accordance with this plan, specifically to help ensure the survival and recovery of the species. While the issue of the ADC Program participation in wolf control in the Northern Rocky Mountains was temporarily resolved in FY 1991 by a Congressional appropriation to the Service to contract ADC personnel to control problem wolves, the underlining issue of funding remains unresolved.

Poisoning from aboveground use of strychnine may exist if the court injunction is lifted and if dead or dying species affected by the control programs are consumed. The aboveground use of strychnine on private lands in Idaho or Washington should have little effect on wolf numbers, since there is very little private range or cropland in gray wolf areas of these two States. Primary use of strychnine aboveground in Montana will be for Columbian ground squirrel control. The gray wolf is likely to consume any strychnine-poisoned animals encountered. Outdoor, aboveground strychnine use in wolf range in Minnesota would be extremely unlikely even if the court injunction is lifted. In Minnesota, where conflicts between wolves and livestock growers are most frequent, there are no known cases of wolf mortality resulting from the legal uses of strychnine in the last decade. Furthermore, there are only two suspected cases of wolf mortality from illegal strychnine use; both of these cases involved sheep carcasses laced with strychnine near farms where wolf depredation was alleged to be a problem.

Use of M-44s and 1080 toxic livestock collars is prohibited in occupied gray wolf range. Direct mortality to the gray wolf could occur as a result of using neck snares or shooting. Toxicants and neck snares are nonselective and could kill animals not intended to be killed (e.g., a nonproblem wolf). The ADC Program does not use snares or leghold traps to control coyotes in Minnesota (Wetzel, pers. comm. 1990). The live-capture of problem wolves by leghold traps and other methods may cause stress to the animals. Leghold traps in sizes No. 3N or smaller are not likely to adversely affect adult wolves, but may pose a threat to juvenile wolves. Aerial hunting for coyotes by a trained and experienced aerial gunner has recently resulted in death of a wolf in North Dakota. This incident occurred in an area not occupied by wolves for many years.

"Occupied gray wolf range" will be defined as (1) an area in which gray wolf presence has been confirmed by State or Federal biologists through interagency wolf monitoring programs, and the Fish and Wildlife Service has concurred with the conclusion of wolf presence, or (2) an area from which multiple reports judged likely to be valid by the Fish and Wildlife Service have been received, but adequate interagency surveys have not yet been conducted to confirm presence or absence of wolves.

The Forest Service and Bureau of Land Management must evaluate each application for strychnine use. An environmental assessment is normally prepared with opportunity for public review. The Service reviews the

assessment and, if necessary, conducts separate formal consultation. Thus, the Service has additional opportunities to restrict the aboveground use of strychnine and other toxic chemicals within the habitats of the gray wolf on Federal lands.

In accordance with the existing label, strychnine baits should not be used in the geographic range of the gray wolf except under programs and procedures approved by the EPA. Before baiting, the user is advised to contact the Fish and Wildlife Service or the local State fish and wildlife office for specific information on endangered species. EPA label and use restrictions do not allow the M-44 device to be used in areas where federally listed endangered and threatened animal species may be adversely affected. Therefore, the use of M-44s is prohibited in areas known to be occupied by gray wolves. The use of M-44s in any other areas identified by the Service as gray wolf range will not be allowed without prior consultation with and approval by the Service.

A biological opinion issued to EPA on June 14, 1985, concluded that use of the 1080 toxic livestock collar was not likely to jeopardize the subspecies _Canis lupus lycaon_ (eastern timber wolf) but likely to jeopardize the subspecies _Canis lupus irremotus_ (northern Rocky Mountain wolf). Reasonable and prudent alternatives also were given to the EPA, which in turn provided label restrictions to preclude jeopardy. Those label restrictions also require that the livestock collar _not_ be used in areas where gray wolves may occur.

BIOLOGICAL OPINION

Based on the above information, it is my biological opinion that the use of snares, steel traps and aerial shooting in the ADC Program is not likely to jeopardize the continued existence of the gray wolf nor adversely modify its critical habitat.

INCIDENTAL TAKE STATEMENT

Incidental take of gray wolves may result from use of leghold traps, snares (legs and neck) and tranquilizing guns, and from accidental shooting by aerial coyote hunters. Records show one wolf has been accidentally killed by ADC personnel in the last five-year period. In view of the potential to accidentally kill of a gray wolf during legitimate control operations, the anticipated level of incidental take as a result of implementing the ADC Program is one wolf in each of the State occupied by the eastern and Rocky Mountain subspecies per year.

The Service has determined that this level of impact is not likely to result in jeopardy to the species.

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize incidental take of the gray wolf:

1. ADC personnel shall take all possible precautions to reduce incidental take, including training on the use of drugs for animal immobilization and restraint.

2. ADC personnel shall monitor incidental take to ensure compliance with anticipated take levels.

3. Non-target wolves inadvertently captured alive must be immediately released.

Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, the USDA must comply with the following terms and conditions, which implement the reasonable and prudent measures described above.

1. An incidental take in excess of one wolf in any State (in a given calendar year) will result in cessation of the activity causing take and reinitiation of consultation between the Fish and Wildlife State Office, the ADC State office, and the involved land manager.

2. All leghold traps shall be checked at least once a day in areas known to be occupied by gray wolves.

3. Neck snares shall not be used in areas known to be occupied by gray wolves except for areas where wolves may be a target species.

4. Number 3N or smaller traps may pose a threat to juvenile wolves and therefore should not be used in proximity to occupied dens and rendezvous sites. Upon documentation of wolf pups in the vicinity of control areas, the use of leghold traps shall be in coordination with the Fish and Wildlife Service.

5. The Service's Fish and Wildlife Enhancement Office, in the Regions of the species' occurrence, shall be notified within 5 days of the finding of any dead or injured gray wolf. Cause of death, injury, or illness, if known, also shall be conveyed to those offices. Addresses are:

(Region 1 - Washington, Idaho)
U.S. Fish and Wildlife Service
Lloyd 500 Building, Suite 1692
500 N.E. Multnomah Street
Portland, OR 97232
(503) 429-6150

(Region 3 - Minnesota, Michigan, Wisconsin)
U.S. Fish and Wildlife Service
Federal Building, Fort Snelling
Twin Cities, MN 55111
(612) 231-3276

(Region 6 - Montana, Wyoming)
U.S. Fish and Wildlife Service
P.O. Box 25486
Denver Federal Center
Denver, CO 80225
(303) 236-8166

6. ADC personnel shall participate fully in interagency wolf monitoring programs.

7. ADC personnel also shall informally consult on an annual basis with the State offices of the Fish and Wildlife Service on the current status of the wolf in areas where recolonization is occurring.

SAN JOAQUIN KIT FOX (Vulpes macrotis mutica) - E

BIOLOGICAL OPINION

Status of the Species (largely from USFWS 1991g)

The San Joaquin kit fox is a small canid that weighs approximately 5 pounds (Hall and Kelson 1959). This subspecies was historically distributed within an 8,700 square mile area in central California, extending in the north from the vicinity of Tracy in the upper San Joaquin Valley, south to the general vicinity of Bakersfield. Intensive agriculture, urbanization, and other land-modifying actions have eliminated extensive portions of this habitat. Kit foxes currently are limited to the remaining grassland, saltbush, open woodland, alkaline sink valley floor habitats , and similar habitats located along eastern and western bordering foothills and adjacent valleys and plains (O'Farrell 1983). Foraging for a variety of rodents and lagomorphs typically occurs at night, although animals have been observed stalking California ground squirrels (Spermophilus beecheyi) during daylight hours, and pups may be observed during the day at den sites. Dens are usually constructed on gentle slopes or level areas. As few as one or as many as 32 or more entrances may be excavated at each site. Kit foxes will also opportunistically utilize man-made structures such as culverts or pipes, or may enlarge abandoned ground squirrel burrows as denning sites (O'Farrell 1983).

Remaining kit fox populations are represented by family groups that have been isolated from other groups by fragmentation of their habitat. This makes this subspecies subject to local extirpation and genetic loss from activities that would impact these family groups (Knudson, per. comm. 1992).

This species is imminently in danger of extinction because of continuing rapid loss of habitat. Although agricultural conditions and oil and gas development are by far the greatest source of loss, urban expansion, predation, and road kills also contribute substantially to the vulnerability of this species. Two other wild canids, the introduced red fox and coyote compete for food resources with the smaller kit fox. This

competition for food resources increases during drought periods when the food resources these species rely on decline to low population levels. The kit fox is also preyed upon by the coyotes and red fox. Expanding red fox populations throughout the San Joaquin Valley present a serious threat to the kit fox. Coyote control programs are being implemented in the San Joaquin kit fox' range and red fox control programs are being pursued in other areas where they are posing a threat to listed species.

Effects of the Proposed Action

Adverse impacts to the San Joaquin kit fox from ADC activities could occur. Leg-hold traps, snares and M-44 devices, shooting, and denning, which are commonly used to control coyotes can pose risks to kit fox because of the possibility of inadvertently capturing or killing individual kit foxes. Rodent control agents such as anticoagulants and fumigants, also pose risks to kit foxes because of the dangers of primary or secondary poisoning.

BIOLOGICAL OPINION

Because of the potential for rodent control activities to take the fox, it is my biological opinion that the ADC Program is likely to jeopardize the continued existence of the San Joaquin kit fox.

REASONABLE AND PRUDENT ALTERNATIVES

The Section 7 regulations have defined reasonable and prudent alternatives as alternative actions, identified during formal consultation, that can be implemented in a manner consistent with intended purpose of the action, that can be implemented consistent with the scope of the Federal agency's legal authority and jurisdiction, that are economically and technologically feasible, and that the Service believes would avoid the likelihood of jeopardizing the continued existence of listed species or result in the destruction or adverse modification of critical habitat.

The reasonable and prudent alternative to preclude jeopardy during coyote and rodent control is as follows:

1. Snares, M-44 devices, toxicants and fumigants shall not be used to control predator species within the recognized occupied range of the San Joaquin kit fox.

2. Leghold traps used within the kit fox range shall be equipped with built-in pan tensioning devices such that at least 4.5 pounds of pressure is required to spring the trap. Tensioning devices shall be permanently attached, either by the manufacturer or by ADC personnel, in such a manner that they are unlikely to become inadvertently detached during use. Easily detachable tensioning devices shall not be permitted.

3. Shooting shall be conducted only by ADC personnel trained and experienced in canine identification to prevent inadvertent shooting of San Joaquin kit foxes.

4. Use of chemical agents to control rodents within the range of the San Joaquin kit fox shall be subject to the following restrictions:

a. All methods of rodent control utilizing EPA registered compounds must be applied with strict observance of EPA approved label restrictions.

b. Zinc phosphide, a compound known to be minimally toxic to kit foxes, shall be the only chemical utilized for rodent control within the occupied range of the San Joaquin kit fox.

and

5. Any take of kit foxes is to be reported immediately to the Sacramento Field Office.

U.S. Fish and Wildlife Service
2800 Cottage Way, Room E-1803
Sacramento, CA 95825
(916) 978-4613

Because the Service finds jeopardy to the ferret, the Agency is required to notify the Service of its final decision whether the reasonable and prudent alternative will be implemented.

INCIDENTAL TAKE STATEMENT

Assuming implementation of the reasonable and prudent alternative, the Service does not anticipates that any kit foxes will be taken as a result of this action.

JAGUARUNDI (Felis yagouaroundi cacomitili) - E
OCELOT (Felis pardalis) - E

Because the ADC Program's operations in Texas may affect the jaguarundi and ocelot, the ADC office in San Antonio, Texas, initiated formal Section 7 consultation with the Service's Corpus Christi Field Office on August 10, 1989. That consultation involves the use of leghold traps, snares, and M-44s in south Texas (the only area in the United States within which ocelot and jaguarundi occur). These predator control tools appear to be the only ADC measures used in this area that may adversely affect these two cats. The Corpus Christi Field Office is currently working on a biological opinion that will be issued sometime during 1992. In view of that pending opinion, we will not address those two species here.

UTAH PRAIRIE DOG (*Cynomys parvidens*) - T

BIOLOGICAL OPINION

Status of the Species

The Utah prairie dog is a burrowing rodent in the squirrel family. This species is confined to disjunct areas in southwest Utah including Beaver, Garfield, Iron, Kane, Piute, Sevier, and Wayne Counties. There is a positive correlation between available moisture and prairie dog abundance and density. Prairie dogs appear to prefer swale type formations where moist herbage is available even during drought periods. A well-drained area is necessary for home burrows. Prairie dogs must be able to inhibit a burrow system approximately 3.3 feet underground without becoming wet. The vegetative height within the colony must be low enough to allow standing prairie dogs to scan their environment for predators.

Prairie dogs are predominantly herbivores. Grasses are preferred food items during all seasons. The flowers and seeds of forbs also are preferred. Although forbs other than alfalfa are not always highly preferred items, they may be critical to a prairie dog town's survival during drought. Cicada (insects) are a preferred animal food item and are readily taken when available. In colonies at low elevations where moist herbage is available, breeding occurs in the early spring and lactation continues into June. Females are capable of giving birth annually to litters that average three to four young usually born in April USFWS 1991f).

The Utah prairie dog population was estimated to be about 95,000 in the 1920s (Heggen and Hassenyager 1977), declining to a 1976 spring count of 2,160 adult animals (Turner 1979). Overall numbers have increased during the period 1976-1989 with the 1989 spring count of 7,377.

The decline of the Utah prairie dog was caused by human-related alteration and by poisoning, which resulted from the belief that prairie dogs compete with domestic livestock for forage. At present, the Utah prairie dog is still threatened by the loss of habitat over much of its range. In addition, the damage caused by local concentrations of prairie dogs has provoked farmers in some areas to kill them illegally to protect crops and cropland.

Effects of the Proposed Action

A May 25, 1988, biological opinion issued to the EPA concluded that no jeopardy to the Utah prairie dog would occur as a result of the aboveground use of strychnine. Label restrictions require that strychnine not be used aboveground for jackrabbit, prairie dog, ground squirrel, kangaroo rat, and vole control in areas occupied by the Utah prairie dog in Garfield, Iron, Kane, Piute, Sevier, and Wayne Counties, Utah. These restrictions should extend also to Beaver County, Utah, which has suitable but currently unoccupied Utah prairie dog habitat.

Zinc phosphide, aluminum phosphide, and burrow fumigants also could adversely affect the Utah prairie dog. However, ADC personnel do not conduct nor recommend prairie dog control within the range of the Utah prairie dog. The control method most likely to take Utah prairie dogs is the steel trap deployed for coyote control. Pan tension devices are used for leghold traps placed in Utah prairie dog habitat for coyote control.

BIOLOGICAL OPINION

Given the above restrictions, it is my biological opinion that use of zinc phosphide, aluminum phosphide burrow fumigants and steel traps will not jeopardize the continued existence of the Utah prairie dog.

INCIDENTAL TAKE STATEMENT

The Service does not anticipate the proposed action will result in any incidental take of the Utah prairie dog.

ALEUTIAN CANADA GOOSE (*Branta canadensis leucopareia*) - T

BIOLOGICAL OPINION

Status of the Species

Historically, the Aleutian Canada goose, a small subspecies of the Canada goose, was known to breed on most of the larger islands in the Aleutian Islands and in the Commander and northern Kuril Island chains (USFWS 1991e). When the species was listed as endangered in March 1967, its only known nesting site was Buldir Island in the western Aleutian Islands, Alaska. Subsequently, remnant flocks have been found on Chagulak Island in the eastern Aleutians (Bailey and Trapp 1984), and Kaliktagik in the Semidi Islands (Hatch and Hatch 1983). The decline of this subspecies is largely attributed to predation resulting from the introduction of foxes and other small mammals to the Aleutian Islands during the period 1836 to 1930 (USFWS 1991e).

Historically, recreational and subsistence take of this subspecies in the Pacific Flyway was a significant factor preventing the remnant breeding segments from recovering. The actual wintering areas were not known until the recovery of the first banded birds was reported in late 1974 in California. The wintering habitat for this subspecies has been the focus of study from 1974 to the present (Byrd and Woolington 1983). Areas in California and Oregon, essential to winter survival, have been identified and partially protected by inclusion of the lands used in the National Wildlife Refuge System or California's Department of Fish and Game Wildlife Area and State Park systems. Additionally, staging and migration areas, and additional wintering areas in Alaska, Washington and Oregon have been closed to the hunting of this and/or other subspecies of Canada goose, offering further protection.

On the principal wintering grounds in California, hunting closure zones have been in effect since 1975, in order to protect these geese. These closure zones have been largely responsible for allowing the wild population to increase from 790 birds in 1975 to as many as 7,800 birds in January of 1992. The Aleutian Canada goose was first listed as "endangered" in March 11, 1969. On December 12, 1990, the Aleutian Canada goose was reclassified as "threatened." This reclassification has not changed the level of protection afforded it under the Endangered Species Act (USFWS 1991e).

Extensive recovery efforts have concentrated primarily on the western Aleutians flock (Buldir, Agattu, and Nizki) because the eastern Aleutian and Semidi Island flocks were unknown when the first recovery plan was developed. A revised plan has been prepared. The recovery team currently considers the three island group flocks to be separate "breeding segments." Each breeding segment has its own recovery agenda and target population levels in the revised recovery plan. The recovery team considers the three breeding segments to constitute a single population of the Aleutian Canada goose subspecies (USFWS 1991e).

With the continued growth of the Aleutian Canada goose numbers there is likely to be an expansion of its range, primarily in and about the current use areas in California, namely the northern coast, the Sacramento Valley, and the San Joaquin Valley and, secondarily, into parts of western Oregon and southwestern Washington. Aleutian Canada geese are regularly reported in the Willamette Valley of Oregon in September and early October. The greatly reduced goose hunting required for protection of the Dusky Canada goose and the abundance of winter pasture, makes this area a likely spot for range expansion by Aleutians (Bartonek 1990).

Effects of the Proposed Action

Avitrol, used in bird control, and zinc phosphide and aboveground strychnine grain baits used for rodent control, could adversely affect this species if ingested. However, recent mortalities diagnosed by the National Wildlife Health Research Center at Madison, Wisconsin were attributable to cholera, lead poisoning or shooting. No poisonings from the above chemicals have been reported.

BIOLOGICAL OPINION

It is my biological opinion, based on the continuing recovery of the species, that the ADC Program will not jeopardize the continued existence of the Aleutian Canada goose.

INCIDENTAL TAKE STATEMENT

The Service anticipates that one Aleutian Canada goose could be taken as a result of the proposed action. This take will be in the form of kill. The continued expansion of the population will increase potential for exposure to these chemicals.

The Service has determined that this level of impact is not likely to result in jeopardy to the species.

REASONABLE AND PRUDENT MEASURES

The Service believes that the following reasonable and prudent measures are necessary and appropriate to minimize incidental take of the Aleutian Canada goose:

1. Measures shall be taken to prevent use of avitrol, zinc phosphide and strychnine on the wintering grounds.

2. Measures will be taken to coordinate with the Fish and Wildlife Service prior to any use off these chemicals on the breeding grounds.

Terms and Conditions

In order to be exempt from the prohibitions of Section 9 of the Endangered Species Act, ADC personnel must comply with the following terms and conditions which implement the reasonable and prudent measures described above:

1. The chemicals listed above shall not be used when Aleutian geese are present in known or likely habitats in Butte, Sutter, Colusa, Glenn, Stanislaus, Merced, Contra Coast, Humboldt and Del Norte Counties, California, as well as Tillamook, Coos, and Curry counties, Oregon unless proposals for use are first reviewed and approved by the Fish and Wildlife Service, Office of Fish and Wildlife Enhancement, Sacramento, California; Incidental take on the wintering grounds shall be reported to that office within 5 days.

2. Proposals to use any of these chemicals on the species' breeding grounds shall first be reviewed and approved by the Fish and Wildlife Service Regional Office, Anchorage, Alaska, and any incidental take should be reported to that office within 5 days.

U.S. Fish and Wildlife Service
Anchorage Fish and Wildlife Enhancement
411 West 4th Avenue
Anchorage, AK 99501
(907) 271-4575

The incidental take statement provided in this opinion satisfies the requirements of the Endangered Species Act, as amended. This statement does not constitute an authorization for take of listed migratory birds under the more restricted provisions of the Migratory Bird Treaty Act. The Service is developing a program to address incidental take under the Migratory Bird Treaty Act.

BALD EAGLE (<u>Haliaeetus</u> <u>leucocephalus</u>) - E
BALD EAGLE - T (5 STATES)

BIOLOGICAL OPINION

<u>Status of the Species</u>

The bald eagle is a wide ranging species, found in all of the 48 contiguous states at some point in its life cycle. Currently, bald eagles are federally listed as endangered in 43 states and threatened in 5 states (Washington, Oregon, Minnesota, Wisconsin and Michigan). Breeding concentrations occur in the Pacific Northwest, Great Lakes States, Maine, the Chesapeake Bay, and Florida. A unique, desert-nesting population is found in Arizona (USFWS 1982c).

The locations of wintering concentrations of bald eagles are predictable but more loosely defined, and usually occur in response to prey availability (ice-free areas affording fishing opportunities, waterfowl concentrations, etc.) and favorable habitat conditions (roost sites, etc.).

The Service has identified five bald eagle populations for recovery purposes: the Pacific states, Northern states, Southwest, Southeast, and Chesapeake Bay. Since the cancellation of DDT by the EPA in 1972, bald eagle breeding populations in all of these areas have been increasing. On February 7, 1990, the Service published a Notice of Intent (55 FR 4209) to reclassify the bald eagle from endangered to threatened throughout all or portions of its range, but to date no formal reclassification proposal has been published. The nesting population in the contiguous states for 1990 was 3,014 pairs estimated at 3,014 pairs (Kjos 1992).

<u>Effects of the Proposed Action</u>

Bald eagles may be taken as a result of both chemical and nonchemical methods of control.

<u>I. Chemical Control Methods</u>

Strychnine

Bald eagles are both predators and scavengers, with fish being a primary food item. They also feed on carcasses of nearly any vertebrate, making the species vulnerable to poisoning following consumption of animals killed by chemical control methods.

According to the ADC Biological Evaluation, the aboveground use of strychnine to control rodents, rabbits and "nuisance birds" may affect bald eagles. Aboveground use of strychnine may result in poisoning bald eagles if dead or dying animals are consumed. Strychnine is very toxic to most mammals and birds, (except gallinaceous birds which are relatively resistant). The main hazard to bald eagles comes from consuming cheek pouches or intestinal parts of animals containing high amounts of

strychnine. The possibility of bald eagles picking up a poisoned animal exists because many poisoned rodents and all birds die aboveground.

In its May 25, 1988, biological opinion to the EPA on the aboveground uses of strychnine, the Service cited reports indicating that 28 bald eagles were known to have been poisoned or killed by aboveground use of strychnine between 1964 and 1986. While many of these strychnine poisonings may have been due to improper or inappropriate application methods, at least six deaths were the result of approved use of strychnine for ground squirrel control.

ADC non-target kill records indicate that no bald eagles have been taken by any program use of strychnine during the past five years.

Strychnine labels advise users to contact the Regional Office of the U.S. Fish and Wildlife Service or the state Fish and Wildlife Office for specific information on endangered species. In addition, current labels for strychnine grain baits contain restrictions which, if followed, should help protect eagles from secondary uptake of strychnine. Users are required to pick up carcasses of rodents, etc., that are found aboveground and dispose of them properly. However, bald eagles may be attracted to dying as well as dead rodents and birds, and the requirement that carcasses be removed may not totally eliminate the hazard at a control site.

ADC personnel currently restrict use of strychnine to field rodent and nuisance bird control efforts.

BIOLOGICAL OPINION

1. Bald Eagle Recovery Units (except Southwest)

Assuming that ADC personnel follow current label restrictions, it is my biological opinion that aboveground use of strychnine is not likely to jeopardize the continued existence of this species, except the southwest recovery unit as outlined below.

2. Bald eagle (Southwest Recovery Unit)

As stated earlier, necropsies on bald eagle carcasses between 1964 and 1986 revealed that 28 mortalities were attributable to strychnine poisoning. Some of the eagle carcasses were recovered near rodent control areas. Three of the 28 eagle carcasses were collected in Arizona.

The threat of strychnine poisoning exists in the Southwest, especially if the toxicant is applied near bald eagle nesting and roost sites. The small number of breeding territories in the region renders this population particularly vulnerable to the adverse effects of aboveground use of strychnine. Currently there are 24 occupied territories in Arizona and two in New Mexico (USFWS, Region 2, file data. 1992). Any losses of breeding bald eagles from this region constitute a significant threat to the continued existence of the species.

Therefore, it is my biological opinion that the aboveground use of strychnine in Arizona and New Mexico from mid-November through mid-July (approximate nesting period), is likely to jeopardize the continued existence of the Southwestern population of bald eagles.

REASONABLE AND PRUDENT ALTERNATIVES - Southwest bald eagle recovery unit

The Section 7 regulations have defined reasonable and prudent alternatives as alternative actions, identified during formal consultation, that can be implemented in a manner consistent with intended purpose of the action, that can be implemented consistent with the scope of the Federal agency's legal authority and jurisdiction, that are economically and technologically feasible, and that the Service believes would avoid the likelihood of jeopardizing the continued existence of listed species or result in the destruction or adverse modification of critical habitat.

1. In concert with the EPA, ADC personnel must develop new label and use restrictions that would prohibit the aboveground use of strychnine within a 10-mile radius of known bald eagle nest sites in Arizona and New Mexico during the aforementioned nesting period and at known roost sites year-around or;

2. ADC personnel must contact the Service's Albuquerque and New Mexico Field Offices for specific bald eagle habitat locations and nesting periods. If the proposed application is within eagle habitat when the birds may be nesting or roosting, the use of strychnine shall be prohibited. If it is determined that the use is outside of the delineated habitat, the chemical could be applied.

Because this biological opinion has found jeopardy, the USDA is required to notify the Service of its final decision on the implementation of either reasonable and prudent alternative.

<u>II. Nonchemical Control Methods</u> - All populations

Leghold Traps

Leghold traps are frequently used to capture mammals such as coyote, bobcat, fox, mink, beaver, raccoon, skunk, muskrat, nutria, wolves, and mountain lion. In some situations a carcass or a large piece of meat (i.e., a draw station) is used to attract target animals into an area where traps are set. It is ADC Program policy to set leghold traps no closer than 30 feet from a draw station to prevent the capture of non-target animals. Exceptions to this policy are made for trapping mountain lions where traps are set at lion food cache sites that are usually in timbered areas. The trap can be set under a wide variety of conditions, and pan tension devices are used to prevent smaller animals from springing the trap, thus allowing a degree of selectivity not available with many other methods.

The leghold trap often permits the release of non-target animals. However, some bald eagles incidentally captured in leghold traps may die or require

removal from the wild. Personnel at the University of Minnesota's Raptor Center indicate that leghold trap injuries comprise approximately 19 percent of the bald eagle injuries treated at the Center each year. Gang or multiple set leghold traps pose additional problems for bald eagles. Eagles captured in one trap will struggle or flail their wings, often resulting in a wing being caught in a second trap. Thus the trapped bird may sustain both leg and wing injuries. In addition, target species captured in multiple trap sets may attract opportunistic bald eagles intent on feeding on the captured animal. During feeding activity, the eagle may be trapped in a second trap.

BIOLOGICAL OPINION - All populations

Despite the foregoing, there is no evidence to indicate that ADC trapping activities are having significant adverse effects on bald eagles. Bald eagle populations are increasing throughout the United States. ADC personnel have reported one loss of eagles from leghold traps used as part of their Program in the last five years. Therefore, it is my biological opinion that the ADC trapping program will not jeopardize the continued existence of the bald eagle.

Snares

Snares are among the oldest existing control tools. Snares can be used to catch a variety of target species, but are most frequently used within the ADC Program to capture coyotes, beaver, bear, and mountain lion. Snares can be used effectively wherever an animal moves through a restricted lane of travel. As snares are typically deployed in this manner, there is normally minimal risk to bald eagles. The Service has been informed of the killing of two bald eagles by snares in the State of Maine in February, 1989. The birds were taken by Maine Department of Inland Fisheries and Wildlife personnel engaged in coyote trapping activities. The use of bait was the principal factor for attracting these eagles, and the snares were set so close to clearings that bait was visible to these birds from the ground. These incidents demonstrate that snares may pose a risk to bald eagles under certain circumstances. However, they are the only occurrences known. ADC Program policy is not to set snares within 30 feet of exposed bait.

BIOLOGICAL OPINION - all populations

It is my biological opinion that the use of snares will not jeopardize the continued existence of the bald eagle in the United States.

INCIDENTAL TAKE STATEMENT
(all populations)

Assuming implementation of the reasonable and prudent alternatives described above, the Service does not anticipate that the proposed action will result in an incidental take of bald eagles in the Southwest population. The

Service anticipates that no more than two bald eagles per year could be taken in the remaining four populations as a result of strychnine use. This take is expected in the form of kill.

The Service has determined that this level of impact is not likely to result in jeopardy to the species.

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize incidental take of the bald eagle:

1. Strychnine shall not be used within five miles (except Southwest population which is 10 miles) of an active nest, active winter or summer roost, or hack site.

2. When bald eagles are in the immediate vicinity of a proposed control program, ADC personnel must conduct daily checks for carcasses or trapped individuals. Carcasses of target animals taken with any chemical that may pose a secondary poisoning hazard must be immediately removed and disposed of in a manner that prevents scavenging by any non-target species.

Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, the USDA must comply with the following terms and conditions which implement the reasonable and prudent measures described above.

1. ADC personnel shall contact either the local State fish and game agency or the appropriate regional or field office of the Service to determine nest and roost locations.

2. If a bald eagle is incidentally taken in the Southwest population, use of the control method will be halted immediately, and ADC must reinitiate consultation.

3. The appropriate U.S. Fish and Wildlife Service office shall be notified within 5 days of the finding of any dead or injured bald eagle. Cause of death, injury, or illness, if known, should be provided to those offices.

4. Leghold traps (except those used to trap mountain lions) shall be placed a minimum of 30 feet from aboveground bait sets.

The incidental take statement provided in this opinion satisfies the requirements of the Endangered Species Act, as amended. This statement does not constitute an authorization for take of listed migratory birds under the more restricted provisions of the Migratory Bird Treaty Act or the Bald and Golden Eagle Protection Act. The Service is developing a program to address incidental take under the Migratory Bird Treaty Act.

PEREGRINE FALCON (*Falco peregrinus anatum*) - E
ARCTIC PEREGRINE (*Falco peregrinus tundrius*) - T

BIOLOGICAL OPINION

Status of the Species

The peregrine falcon is a medium-sized raptor. The anatum subspecies breeds in the boreal forest regions of Alaska and the Yukon Territory, and south of the tree line in northern and eastern Canada to northern Mexico. American peregrine falcons winter from southern United States to South America, with northern populations tending to winter farther south. The Arctic subspecies breeds in the tundra regions of Alaska, Canada, and Greenland, and winters in South America. Limited critical habitat has been designated in Lake, Napa and Sonoma Counties, California.

Extensive use of organochlorine pesticides is considered the primary reason for the decline of peregrine falcons (USFWS 1991d). Since restrictions were placed on the use of DDT in the early 1970s, populations stabilized, and in 1978 began to increase. Based on recent literature (1990), there are approximately 670 anatum pairs in the western United States (Burnham and Cade 1992). Peregrine falcons in the eastern United States were extirpated by the late 1970s, and a captive release program resulted in the establishment of over 100 breeding pairs by 1990 (USFWS 1991d). Population increases continue to the present in nearly all areas. American peregrine falcons, especially those at higher latitudes are highly migratory as is much of their prey. As a result, both peregrines and their prey spend a large portion of the year outside the boundaries of the United States.

Effects of the Proposed Action

As peregrine populations continue to increase throughout the United States, more breeding pairs and more wintering birds are occupying large cities. This increases the likelihood of their feeding on pigeons poisoned by aboveground use of strychnine during routine control operations. Such poisoning has occurred in the past in Baltimore, Maryland and Norfolk, Virginia, and at least four peregrines succumbed to strychnine during the early 1980s. These deaths were not related to the ADC Program, and the Service is not aware of any recent deaths. ADC personnel recognize the hazards of aboveground use of strychnine and restrict the aboveground use to strictly regulated field rodent and nuisance bird control. Most control activities would likely be in urban areas, feedlots, grain storage facilities, and around bridges.

BIOLOGICAL OPINION

It is my biological opinion that the use of strychnine in the ADC Program will not jeopardize the continued existence of the peregrine falcon or adversely modify its critical habitat.

INCIDENTAL TAKE STATEMENT

The Service does not anticipate that the proposed action will result in incidental take of the peregrine falcon.

NORTHERN APLOMADO FALCON (Falco femoralis septentrionalis) - E

BIOLOGICAL OPINION

Status of the Species

Habitat of this endangered species includes open terrain with scattered trees or shrubs. In the United States, this falcon may be found almost year-around (June through February) on the Laguna Atascosa National Wildlife Refuge, Cameron County, Texas. Between 1986 and 1989, 18 northern aplomado falcons (falcons) were successfully hacked on this Refuge. Texas has had some scattered sightings of wild falcons in the recent past (Frio County, 1980; Laguna Atascosa National Wildlife Refuge, 1983 and 1986; and Sabal Palm Grove, Cameron County, 1989). Individual falcons have also been sighted on the Gabrielson and Palmview Units of the Rio Grande Valley National Wildlife Refuge, Hidalgo County, and in the vicinity of Brownsville, Fafurrias and Valentine, Texas. The Laguna Atascosa National Wildlife Refuge and some adjoining private land was the only area in the United States categorized as habitat occupied by northern aplomado falcons in 1990. In June 1991, this falcon was confirmed in Otero County, New Mexico. Modification of this falcon's grassland habitat as a result of agricultural development and pesticide use, and brush invasion are the causes of this bird's decline (USFWS 1990b).

The northern aplomado falcon feeds upon birds, insects, rodents, and reptiles. Most of its hunting occurs before noon or during late afternoon within approximately 1/2 mile of its nest, though hunts may also occur up to 2 1/2 miles from the nest (USFWS 1990b).

Effects of the Proposed Action

Although the ADC Program could affect the northern aplomado falcon prey base by reducing the number of available blackbirds and small rodents through the use of avicides and rodenticides, the possibility is considered remote because the species feeds on such a variety of prey. The rodenticides used do not pose secondary poisoning hazards.

BIOLOGICAL OPINION

It is my biological opinion that the ADC Program is not likely to jeopardize the continued existence of the northern aplomado falcon.

INCIDENTAL TAKE STATEMENT

The Service does not anticipate that the ADC Program will result in any incidental take of the northern aplomado falcon.

ATTWATER'S PRAIRIE CHICKEN (*Tympanuchus cupido attwateri*) - E

BIOLOGICAL OPINION

Status of the Species

This endangered Gulf coastal prairie subspecies once inhabited an area from southwestern Louisiana to the Nueces River, Texas. It is now restricted to Texas and numbers approximately 456 birds. Its distribution is also significantly reduced, and individual isolated populations located in various counties have dropped to as few as two Attwater's prairie chickens in one of the seven counties inhabited by this bird. Current (USFWS, Region 2, file data 1992) distribution of the Attwater's prairie chicken is as follows:

County	Population
Austin	48
Colorado	50
Victoria	2
Galveston	26
Refugio	330
Goliad	2 (incidental)

The Attwater's prairie chicken inhabits both cultivated and uncultivated lands, including areas grazed by livestock. It is largely an herbivorous bird, though it also eats some insects. Coastal prairie is essential for nesting cover, but the prairie chicken also utilizes cultivated areas of corn, cotton, milo, peanuts, rice, sorghum, and soybeans. The Attwater's prairie chicken is found in various types of vegetative cover depending on the season. Light to little cover may be used for courtship, while heavier cover is used for roosting. Medium to heavy cover is important for nesting, loafing, and escape. Feeding occurs in all types of cover (USFWS 1983).

Effects of the Proposed Action

Chemicals used by the ADC Program such as zinc phosphide coated grain to control rodents could kill prairie chickens, but this chemical's pesticide registration prohibits such use within Attwater's prairie chicken habitat. The use of leghold traps for predator control within the habitat of this bird is the only apparent part of the ADC Program that could adversely affect this species. Predators of the prairie chicken include armadillos, coyotes, house cats, dogs, various raptors, opossums, raccoons, and skunks. Trapping predators could have a beneficial effect upon prairie chicken nest depredation and individual birds. Conversely, leghold traps set for

some of these animals could catch prairie chickens, resulting in their death or injury.

BIOLOGICAL OPINION

ADC leghold trapping potentially occurs within prairie chicken habitat. Though the probability of these traps catching a prairie chicken is low, loss of one or more of these birds could be devastating to distribution and genetic makeup of the population, therefore, it is my biological opinion that the use of leghold traps by the ADC Program is likely to jeopardize the continued existence of Attwater's prairie chicken.

REASONABLE AND PRUDENT ALTERNATIVES

The Section 7 regulations have defined reasonable and prudent alternatives as alternative actions, identified during formal consultation, that can be implemented in a manner consistent with intended purpose of the action, that can be implemented consistent with the scope of the Federal agency's legal authority and jurisdiction, that are economically and technologically feasible, and that the Service believes would avoid the likelihood of jeopardizing the continued existence of listed species or result in the destruction or adverse modification of critical habitat.

A reasonable and prudent alternative to preclude jeopardy is to use tensioning devices on the leghold traps in prairie chicken habitat to prevent prairie chickens from tripping the trap.

Because this biological opinion has found jeopardy, the USDA is required to notify the Service of its final decision on the implementation of the reasonable and prudent alternatives.

INCIDENTAL TAKE STATEMENT

The Service does not anticipate that the proposed action will result in the incidental take of the Attwater's prairie chicken if the reasonable and prudent alternative is implemented.

WHOOPING CRANE (*Grus americana*) - E

BIOLOGICAL OPINION

Status of the Species

The wild whooping crane populations consist of the major Aransas-Wood Buffalo whooping crane flock and a much smaller Rocky Mountain flock developed by cross-fostering into sandhill crane nests. The former migrates 2,500 miles in the spring (April), from the Texas Gulf Coast to Wood Buffalo National Park, Northwest Territories, Canada (Smith et al. 1986). Their fall migration through the Dakotas, eastern Montana, Nebraska, Kansas, western Oklahoma and central Texas, begins in September and is largely

complete by November, with some stragglers arriving in December. The Rocky Mountain flock migrates in March and April from New Mexico and passes through Colorado and Wyoming and summers in Wyoming, Idaho, and Montana. The fall migration of the Rocky Mountain population occurs from mid-September through early November, reversing the spring route.

This crane's habitat includes a broad range of natural and man-influenced wetlands, croplands, and pasture. This omnivorous bird eats natural foods (insects, frogs, fish, plant tubers, acorns, berries, clams, crayfish, aquatic insects, etc.) and cultivated grains (barley, corn, milo, sorghum, wheat) left after harvest (Lewis 1980).

Cranes using the migration habitat are most likely to be exposed to chemicals used in the ADC Program. Data from the Wood Buffalo flock indicates individuals do not always use the same stopovers for roosting and feeding. Evidence indicates that repeated use of sites is primarily a random happening. Two major United States staging areas are the Platte River, Nebraska, and the San Luis Valley, Colorado. Critical habitat for the migration route and wintering areas has been designated in Colorado, Idaho, Kansas, Nebraska, Oklahoma, and Texas.

Effects of the Proposed Action

ADC personnel restrict their own use of and do not recommend use of Avitrol, DRC-1339, zinc phosphide rodent baits, or strychnine grain baits where whooping cranes are known or believed to be present. Therefore, the ADC Program's use of these chemicals limits the possibility of adverse effects upon the whooping crane.

BIOLOGICAL OPINION

It is my biological opinion that the toxicants used in the ADC Program are not likely to jeopardize the continued existence of the whooping crane or adversely modify its critical habitat.

INCIDENTAL TAKE STATEMENT

The Service does not anticipate that the ADC Program will result in any incidental take of the whooping cane.

MISSISSIPPI SANDHILL CRANE (Grus canadensis pulla) - E

BIOLOGICAL OPINION

Status of the Species

Most Mississippi sandhill cranes (Grus canadensis pulla) survive on the Mississippi Sandhill Crane National Wildlife Refuge in Jackson County, Mississippi. This bird's present range is from the Pascagoula River (east), to the Jackson County line (west), to the vicinity of Simmons Bayou (south),

to 4 miles north of the town of Vancleave (north). The entire population has been estimated at less than 100 birds every year since 1929 (USFWS 1991b).

Savannas are the preferred habitat of the Mississippi sandhill crane and are inhabited year-around. Crane feeding habitats vary with the season. In the summer the birds feed upon the natural foods found in swamps, savannas, and open forests including insects, earthworms, crayfish, small reptiles, frogs and other amphibians that can be captured on the ground. During the other three seasons the birds eat small corn and chufa (introduced plants). Although some nesting occurs in forested areas, most takes place in open savannas and swamp openings. Nesting territories are generally used for more than 1 year, some for 10 to 17 years (USFWS 1991b). Critical habitat has been designated in Jackson County, Mississippi.

In the mid-1970s, a captive population of Mississippi sandhill cranes was established at the Patuxent Wildlife Research Center in Laurel, Maryland. Developed with wild Mississippi sandhill crane eggs, the captive population numbered 32 adults in 1989. Captive releases to the Mississippi Sandhill Crane Refuge began in 1981, and by 1983 there were 13 free-flying captive-raised cranes on the Refuge. A total of 96 captive-raised cranes had been released by 1989, and 53 of these have survived. By 1990, eight captive-raised cranes had attempted to nest (USFWS 1991b).

In response to predation by canids at the Mississippi Sandhill Crane National Wildlife Refuge, M-44 predator control devices were used on the Refuge by Service personnel. Subsequently, crane No. 646, a Patuxent captive-reared immature bird released onto the Refuge in late 1984, was killed when it set off a sodium cyanide loaded M-44 device in November 1985. Use of M-44's was immediately discontinued within the Refuge (Pers. Comm., Refuge Manager 1992).

Also two captive-reared cranes (Nos. 857 and 861) were accidentally caught in leghold traps in 1987 on the Refuge. Both birds were taken to the Louisiana State University Veterinary School where they later died. The cause of death of crane No. 857 was capture myopathy and aspergillus. The cause of death for crane No. 861 was not listed. Consequently, the use of leghold traps on the Refuge has been discontinued (Pers. Comm., Refuge Manager 1992).

Effects of the Proposed Action

Because Mississippi sandhill cranes frequently forage off the Refuge within Jackson County, Mississippi, there may be potential for the cranes to come in contact with predator control devices. An M-44 device placed in a foraging area could kill any crane coming in contact with it. Leg-hold traps would also pose a risk of injury or death in crane foraging habitat.

BIOLOGICAL OPINION

Due to the Mississippi sandhill crane's limited population and precarious status, the loss of any individual would pose a serious threat to the survival and recovery of the species. Therefore, it is my biological opinion that the use of M-44s and steel traps in the ADC Program is likely to jeopardize the continued existence of the Mississippi sandhill crane. Critical habitat will not be adversely modified.

REASONABLE AND PRUDENT ALTERNATIVES

The Section 7 regulations have defined reasonable and prudent alternatives as alternative actions, identified during formal consultation, that can be implemented in a manner consistent with intended purpose of the action, that can be implemented consistent with the scope of the Federal agency's legal authority and jurisdiction, that are economically and technologically feasible, and that the Service believes would avoid the likelihood of jeopardizing the continued existence of listed species or result in the destruction or adverse modification of critical habitat.

As a reasonable and prudent alternative to preclude jeopardy to the Mississippi sandhill crane, the ADC Program shall not use M-44 devices or leghold traps in designated Critical Habitat and other known nesting, roosting and foraging habitat used by this species: The Fish and Wildlife Service (Refuge Manager, Mississippi Sandhill Crane National Wildlife, 7200 Crane Lane, Gautier, MS 39553, telephone 601/497-6322) shall be contacted prior to any ADC work involving the use of these predator control methods in Jackson County, Mississippi to determine if the Mississippi sandhill crane occurs in the work area.

Because this biological opinion has found jeopardy, the USDA is required to notify the Service of its final decision on the implementation of the reasonable and prudent alternatives.

INCIDENTAL TAKE STATEMENT

Assuming the implementation of the reasonable and prudent alternatives described above, the Service does not anticipate that the proposed action will result in any incidental take of the Mississippi sandhill crane.

CALIFORNIA CONDOR (Gymnogyps californianus) - E

BIOLOGICAL OPINION

Status of the Species

This large, formerly widespread vulture has an historic range that includes the California Coastal Ranges, Central Transverse Range, Southern Sierra Nevada Mountains, to Arizona, New Mexico and Texas. California condor habitat includes rocky cliffs and trees for roosting, open grasslands and

oak woodlands for foraging (Koford 1953). Reproduction occurs at 6 years of age, with a low reproductive rate. A nesting pair only raises one chick/year and 6 months is required for young to fledge (Snyder 1983).

Only 52 birds remain including 50 in captivity at the San Diego and Los Angeles Zoos. During January 1992, two California condors were reintroduced into a portion of their former range in southern California. Decline of the species has occurred as a result of shooting, lead poisoning, secondary poisoning from coyote control, loss of foraging areas due to urbanization, and agricultural development (Wilbur 1980). Critical habitat has been designated in Ventura, Los Angeles, Santa Barbara, San Luis Obispo, Kern and Tulare Counties, California.

Effects of the Proposed Action

In California, strychnine is registered for rodent control. Condors can be exposed to strychnine by consuming poisoned rodents. M-44 devices loaded with sodium cyanide are used to control coyotes. A condor could accidentally trigger an M-44 during foraging, and be poisoned by cyanide. An immature female California condor was apparently killed by an M-44 on November 23, 1983 in Kern County, California.

BIOLOGICAL OPINION

It is my biological opinion that the ADC Program's use of sodium cyanide for coyote control and strychnine for rodent control is likely to jeopardize the continued existence of the California condor. Critical habitat will not be adversely modified.

REASONABLE AND PRUDENT ALTERNATIVES

The Section 7 regulations have defined reasonable and prudent alternatives as alternative actions, identified during formal consultation, that can be implemented in a manner consistent with intended purpose of the action, that can be implemented consistent with the scope of the Federal agency's legal authority and jurisdiction, that are economically and technologically feasible, and that the Service believes would avoid the likelihood of jeopardizing the continued existence of listed species or result in the destruction or adverse modification of critical habitat.

The following reasonable and prudent alternative would preclude jeopardy to the California condor:

1. M-44s should be used in single sets (not closer than 1000 feet from one another). The sets shall be placed so that they do not protrude above the ground level, and shall be covered or capped so they are not visible, and

2. Strychnine use will not be permitted in condor foraging habitat.

These reasonable and prudent alternatives apply to California condor foraging habitat within Ventura, Kern, Santa Barbara, and San Luis Obispo Counties.

Because this biological opinion has found jeopardy, the USDA is required to notify the Service of its final decision on the implementation of the reasonable and prudent alternatives.

INCIDENTAL TAKE STATEMENT

The Service does not anticipate the action will result in incidental take if the reasonable and prudent alternatives are implemented.

DESERT TORTOISE (Gopherus agassizii) - T

BIOLOGICAL OPINION

Status of the Species

The desert tortoise is a large terrestrial turtle which has ranged historically over most of the southern California deserts, in Arizona and the southern part of Utah (USFWS 1980). By 1980, it was eliminated from the Coachella and Imperial Valleys of California (USFWS 1990a). In its desert habitat it feeds on cactus, annual forbs, grasses, and flowers. Ten to 20 years is required to reach breeding age and rate of reproduction is low. Young are soft-shelled and heavily preyed upon, especially by ravens. The species forages from March to June, estivates during the summer in burrows, may emerge in the fall, and hibernates from October to March (Karl 1984).

The total number of individuals is unknown, but estimates are that 100,000 tortoises survive in the Mojave and Sonoran deserts (Lowe et al. 1990). Reasons for the continuing decline include urbanization, off-road vehicle use, mining, energy development, upper respiratory disease (URDS) that has resulted in an estimated 50% of present mortality, losses to pets, vandalism, and the population explosion of ravens (Berry 1984).

The Beaver Dam Slope population of this species, located in southwestern Washington County, Utah, was listed as a threatened species with 309 square miles of critical habitat on August 20, 1980. Subsequently, the entire Mojave population of the desert tortoise (including the Beaver Dam Slope population) was listed as threatened on April 22, 1990. The Mojave population includes all desert tortoises north and west of the Colorado River in California, southern Nevada, southwestern Utah, and Northwestern Arizona. The March 15, 1990 Biological Evaluation of the ADC Program only included the Beaver Dam Slope population, so the majority of the tortoise population and its habitat were not covered in the evaluation.

Effects of the Proposed Action

As stated in the Biological Evaluation, EPA label restrictions preclude the use of gas cartridges and aluminum phosphide in designated critical habitat of the desert tortoise. However, critical habitat has been designated only for the Beaver Dam Slope population.

Gas cartridges made up of potassium and sodium nitrate and the use of aluminum phosphide in predator dens and rodent burrows in the remaining habitat of the Mojave population in Utah, California, Nevada, and Arizona would kill non-target animals including desert tortoises. Additionally, tortoises could be inadvertently crushed in burrows by ADC vehicles.

BIOLOGICAL OPINION

There is potential for exposure from the registered application of aluminum phosphide, and from the use of potassium and sodium nitrate because tortoise burrows may be accidentally treated. This impact would be extremely rare because tortoise burrows are much larger than those of the target species, therefore, it is my biological opinion that ADC Program use of aluminum phosphide, as well as the use of potassium and sodium nitrate, is not likely to jeopardize the continued existence of this species, or adversely modify its critical habitat.

INCIDENTAL TAKE STATEMENT

The Service anticipates that one desert tortoise could be taken as a result of the proposed action. The incidental take is expected to be in the form of kill because of the possibility of crushing a tortoise in burrows located under roads or trails while conducting a control program. These burrows may collapse under the weight of an all terrain vehicle (ATV) or standard-sized vehicle. The Service also anticipates that one tortoise could be taken by burrow fumigants.

The Service has determined that this level of impact is not likely to result in jeopardy to the species.

REASONABLE AND PRUDENT MEASURES

The Service believes that the following reasonable and prudent measures are necessary and appropriate to minimize take of the desert tortoise:

1. Measures shall be implemented to prevent desert tortoises from being killed by any project-related activity.

2. Measures shall be implemented to minimize loss and degradation of desert tortoise habitat by ATVs.

Terms and Conditions

In order to be exempt from the prohibitions of Section 9 of the Endangered Species Act, ADC personnel must comply with the following terms and conditions which implement the reasonable and prudent measures described above:

1. Discovery of one dead or sublethally taken tortoise caused by any of the chemicals, requires immediate cessation of its use within the species range and reinitiation of consultation on that chemical for the tortoise.

2. Aluminum and magnesium phosphide, and sodium and potassium nitrate shall be used within the desert tortoise range only by qualified individuals. Such persons shall be limited to qualified wildlife biologists, or to agents of county agricultural commissioner offices, university extension offices, or representatives of State or Federal wildlife agencies.

3. The size of all access and right-of-way roads associated with ADC Program activities shall be minimized.

4. All vehicle traffic during control activities shall be restricted to roadways and areas that have been cleared of tortoises. The agency requesting control shall provide information to ADC personnel prior to undertaking the proposed action regarding areas where vehicular traffic is not allowed.

GOPHER TORTOISE (Gopherus polyphemus) - T

BIOLOGICAL OPINION

Status of the Species

The gopher tortoise is a large 5.9 to 14.6 inches long, dark-brown to grayish-black terrestrial turtle with elephantine hind feet, shovel-like forefeet, and a gular projection beneath the head on the yellowish plastron or undershell.

This tortoise feeds primarily on grasses, grass-like plants, and legumes. Its diet may also include mushrooms, fleshy fruits, and possibly some animal matter. Sometime between late April and mid-July, the female digs a nest in sandy soil, lays a clutch of 4 to 12 eggs, and after refilling the hole leaves the eggs for incubation by the sun's heat. Hatching occurs in August and September. The juvenile tortoises suffer a heavy natural predation loss of almost 97 percent through the first 2 years of life. Those that survive grow to sexual maturity slowly over a period of 13 to 21 years, depending on the portion of the range and the sex of the turtles. Females usually reach reproductive maturity at 19 to 21 years old. The low reproductive rate is accentuated by the fact that there is some evidence to indicate that not all females nest every year. The juveniles that are

born and survive may live an average of 40 to 60 years, sometimes 80 to 100 (USFWS 1990c).

The gopher tortoise most often lives on well-drained sandy soils in transitional (forest and grassy) areas. It is commonly associated with a pine overstory and an open understory with a grass and forb groundcover and sunny areas for nesting. Most of the gopher tortoise's life is spent in and around the burrow. The burrow becomes a more or less permanent home although there may be alternate burrows in the area. Several other species also may share gopher tortoise burrows. Some commonly known burrow associates include the eastern indigo snake, the eastern diamondback rattlesnake, and the gopher frog. This species occurs in sandy coastal plain areas from extreme southern South Carolina to the southeastern corner of Louisiana, and throughout most of Florida (USFWS 1990c).

Less than 20 percent of the historically available habitat remains for the western population of the gopher tortoise. The population segment from the Tombigbee and Mobile Rivers in Alabama, westward, is classified as threatened, and for convenience is termed the western population. The entire western population is within the original range of the longleaf pine. Using statistics of the U.S. Department of Agriculture, the Fish and Wildlife Service estimates that present ownership distribution of gopher tortoise habitat is approximately 20 percent in the National Forest, 10 percent in other public ownership, 30 percent in forest industry and 40 percent in other private ownership. No estimate is available for the gopher tortoise's total population size. Biologists were able to document only 11 active burrows in Louisiana in 1981, with only one remaining in 1984. There is an indicated decline in population densities ranging from 67 percent in Alabama to 91 percent in Louisiana (USFWS 1991a).

Conversion of gopher tortoise habitat to urban areas, croplands, and pasturelands along with adverse forest management practices has reduced the western portion of the historic range. Taking gopher tortoises for sale or use as food or pets also has had a serious effect on some populations. The seriousness of the loss of adult tortoises is magnified by the length of time required for tortoises to reach maturity and their low reproductive rate. Current estimates of human predation and road mortality alone are at levels that could offset any annual addition to the population. A number of other species also prey upon gopher tortoises including the raccoon, the primary egg and hatchling predator; gray foxes; striped skunks; armadillo; dogs; snakes; and raptors. Imported fire ants also have been known to prey on hatchlings. Reported clutch and hatchling losses often approach 90 percent (Landers et al. 1980).

Effects of the Proposed Action

Toxic baits used in the ADC Program for rodent or predator control could potentially be consumed by the tortoise, but this is considered extremely unlikely in view of their normal diet. In addition, the burrows of the gopher tortoise are commonly utilized by a wide variety of other wildlife, including such potential target species of the ADC Program as fox, skunk,

armadillo, opossum, raccoon, and rabbit. Use of aluminum phosphide, gas cartridges, and other fumigants within gopher tortoise habitat could result in harm or killing of the species, however, woodchucks are the only species treated with fumigants within the species range.

BIOLOGICAL OPINION

It is the my biological opinion that the ADC Program is not likely to jeopardize the continued existence of the gopher tortoise because of restrictions on virtually all fumigants.

INCIDENTAL TAKE STATEMENT

The Service anticipates that one tortoise may be taken by use of fumigants. The Service has determined that this level of impact is not likely to result in jeopardy to the species.

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measure is necessary and appropriate to minimize incidental take:

1. Use of toxic baits (including zinc phosphide, diaphacinone strychnine, and any anticoagulants) and use of fumigants (including aluminum phosphide, gas cartridges, or other burrow fumigants) shall be prohibited within or in close proximity to potential gopher tortoise habitat in Louisiana, Mississippi, and Alabama, unless the following terms and conditions are met:

Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, the USDA must comply with the following terms and conditions, which implement the reasonable and prudent measures described above.

1. Habitat must be adequately surveyed by qualified personnel who have determined that the habitat does not contain active tortoise burrows. This restriction should also apply to potential gopher tortoise habitat that has recently been converted to other uses but has not been completely destroyed. The Service's Jackson Field Office (see address below) can assist ADC personnel in identifying areas of potential tortoise habitat, providing names of qualified personnel for conducting surveys, providing survey techniques, etc.

2. If any incidental take does occur, consultation must be reinitiated with the Jackson Field Office and use of the of the responsible method must cease immediately.

U.S. Fish and Wildlife Service
Enhancement - Suite A
6578 Dogwood View Parkway
Jackson, Mississippi 39213
601/965-4900

BLUNT-NOSED LEOPARD LIZARD (Gambelia silus) - E

BIOLOGICAL OPINION

Status of the Species

The blunt-nosed leopard lizard is a large, robust, lizard that may exceed 15 inches in length (Montanucci et al. 1975). This species was distributed historically throughout the San Joaquin Valley and adjacent interior foothills and plains, extending from central Stanislaus County south to extreme northeastern Santa Barbara County (Montanucci 1965). The lizard prefers open, sparsely vegetated areas of low relief and inhabits valley sink scrub and valley saltbush scrub vegetational communities. The area occupied by this species has been significantly reduced and fragmented by agricultural development, petroleum and mineral extraction, livestock grazing, pesticide application, and off-road vehicle use. Today its distribution is limited to scattered parcels of undeveloped land, with the greatest concentrations occurring on the west side of the Valley floor and in the foothills of the Coast Range. The population is declining (USFWS 1985b).

Farming began in the San Joaquin Valley with the advent of the gold rush and the need to supply the new settlers with food. It accelerated in the 1920's when development of electricity made feasible the use of electrical pumps to tap groundwater supplies. In response to declining groundwater supplies, Federal and State water projects were developed to sustain agriculture. Petroleum and mineral development also occurred resulting in the continuing loss of blunt-nosed leopard lizard habitat. Cumulatively, agriculture, oil and gas development, induced urban growth and the attendant loss of more habitat have contributed to the species' decline. Today urban expansion continued because of the relatively inexpensive land prices in the San Joaquin Valley compared to coastal real estate costs. Improved transportation corridors have facilitate this development. Although these and other factors have eliminated over 90 percent of the native habitats throughout the San Joaquin Valley, irrigated agriculture has had the most profound effect on the blunt-nosed leopard lizard's decline.

The 1980 blunt-nosed leopard lizard Recovery Plan identified habitat essential for the survival and recovery of the species; essential habitat consists of highest quality wildlands currently remaining. The plan, revised in 1988, is being updated again to reflect continuing habitat loss. Between 1983 and 1985, the California Department of Fish and Game documented a reduction from 439,670 acres to 415,350 acres of unidentified essential

habitat for the lizard, a loss of 24,320. Unpublished information, subsequently obtained from the Department of Energy indicates that as much as 80 percent of the identified essential habitat has been lost (USFWS 1985b).

Effects of the Proposed Action

Blunt-nosed leopard lizards typically utilize the San Joaquin kit fox dens and small mammal burrows for shelter. Therefore, some predator or rodent control methods used underground, especially fumigants, could inadvertently harm or kill leopard lizards.

BIOLOGICAL OPINION

It is my biological opinion that use of fumigants in the ADC Program will not jeopardize the continued existence of the blunt-nosed leopard lizard because existing label restrictions preclude use of gas cartridges and that is the major toxicant used. Mortality from other toxicants is far less likely.

INCIDENTAL TAKE STATEMENT

The Service anticipates that one lizard may be taken by underground control methods. The Service has determined that this level of impact is not likely to result in jeopardy to the species.

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize incidental take of the blunt-nosed leopard lizard:

1. Continue to restrict use of fumigants within the range of the blunt-nosed leopard lizard.

Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, the USDA must comply with the following terms and conditions, which implement the reasonable and prudent measure described above.

1. Existing label restrictions prohibiting use of gas cartridges manufactured and distributed by ADC personnel within the range of the San Joaquin kit fox and blunt-nosed leopard lizard shall be continued and adhered to. Fumigants used by ADC personnel for predator control also shall not be used within the range of the blunt-nosed leopard lizard.

2. No rodent control method or agent not discussed or restricted above shall be used within areas likely to be inhabited by blunt-nosed leopard

lizards unless further consultation with the Service is conducted and Service concurrence in any proposed activities is obtained.

3. If one dead or sublethally affected specimen is discovered, use of that pesticide must cease and consultation on that chemical for that species must be reinitiated. Any incidental take shall be reported immediately to the Sacramento Field Office.

U.S. Fish and Wildlife Service
2800 Cottage Way, Room E-1803
Sacramento, CA 95825
(916) 978-4613

EASTERN INDIGO SNAKE (Drymarchon corias couperi) - T

BIOLOGICAL OPINION

Status of the Species

The eastern indigo snake is a large, docile, non-poisonous snake growing to a maximum length of about 8 feet. The color in both young and adults is shiny bluish-black, including the belly, with some red or cream coloring about the chin and sides of the head. Indigo snakes probably reach sexual maturity at 3 to 4 years of age. Based on observations of captive indigos at Auburn University, mating begins in November, peaks in December, and continues in March. Clutches averaging eight to nine eggs laid in late spring hatch approximately 3 months later. The snakes remain active to some degree throughout the winter, often emerging from their own dens whenever air temperatures exceed 50 degrees Fahrenheit (Odum et al. 1977).

This species is currently known to occur throughout Florida and in the coastal plain of Georgia. Historically the range also included southern Alabama, southern Mississippi, and the extreme southeastern portion of South Carolina. The indigo snakes seems to be strongly associated with high, dry, well-drained sandy soils, closely paralleling the sandhill habitat preferred by the gopher tortoise. During warmer months, indigos also frequent streams and swamps, and individuals are occasionally found in flat woods. Gopher tortoise burrows and other subterranean cavities are commonly used as dens and for egg laying. The home range of indigos varies considerably according to season. Based on a study conducted in southwest Georgia, an average seasonal range of 4.8 hectares during the winter (December through April), 42.9 hectares during late spring or early summer (May through July), and 97.4 hectares during late summer and fall (August through November) (Speake et al 1978). The most extensive monthly movements occurred during August. Of a total of 108 dens sites located, 77 percent were in gopher tortoise burrows, 18 percent were in or under decayed stumps and logs, and 5 percent were under plant debris. The study area included windrows of debris piled up in the 1960's during site preparation for a slash pine plantation. The snakes showed some tendency

to prowl and locate their dens near these windrows. This same study also indicated that during May-July that at least 10 percent, and in August-November at least 5 percent, of all indigo snake activity occurred within 150 feet of tortoises. The indigo subdues its prey (including venomous snakes) through the use of its powerful jaws, swallowing the prey usually still alive.

The eastern indigo snake population is declining (USFWS 1982b). The decline is attributed to a loss of habitat due to such uses as farming, construction, forestry, pasture, etc., and to over-collecting for the pet trade. The snake's large size and docile nature have made it much sought after as a pet. The effect of Rattlesnake Roundups on the indigo snakes are speculative. Both indigos and rattlers utilize the burrows of gopher tortoises at certain times. Rattlesnake hunters often pour gasoline down these burrows to drive out the snakes. While some indigos may be killed by this practice, the actual degree of impact on the population is unknown (USFWS 1978). Recovery tasks currently being implemented include habitat management through controlled burning, testing experimental miniature radio transmitters for tracking of juvenile indigo snakes, maintenance of a captive breeding colony at Auburn University, a recapture of formerly released snakes to confirm survival in the wild, presentation of education lectures and field trips, and efforts to obtain landowner cooperation in indigo snake conservation efforts.

Effects of the Proposed Action

Chemical rodent and/or predator control efforts in habitat utilized by the eastern indigo snake may result in incidental take of the indigo snake. The species is not a carrion eater and therefore is not expected to be affected by use of baits for rodent control. However, use of burrow fumigants within areas occupied by the eastern indigo snake could likely result in direct mortality to individuals of the species. Gas cartridges are the only burrow fumigant currently used in the region.

BIOLOGICAL OPINION

It is my biological opinion that the use of fumigants in the ADC Program is not likely to jeopardize the continued existence of the eastern indigo snake because most den sites are in gopher tortoise burrows and these burrows are easily distinguished from those of other species.

INCIDENTAL TAKE STATEMENT

The Service anticipates one indigo snake may be taken by fumigants. The Service has determined that this level of impact is not likely to result in jeopardy to the species.

REASONABLE AND PRUDENT MEASURES

The Service believes that the following reasonable and prudent measure is necessary and appropriate to minimize incidental take:

1. Use of fumigants within the range of the Eastern indigo snake must be strictly controlled.

Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, the USDA must comply with the following terms and conditions, which implement the reasonable and prudent measures described above.

1. Use of aluminum phosphide, gas cartridges, or other burrow fumigants in or adjacent to areas containing active or inactive gopher tortoise burrows (potential habitat of the eastern indigo snake) is prohibited in the states of Florida and Georgia without prior approval from the Service's Jacksonville Field Office (see address below), and in the state of Alabama without prior approval from the Service's Jackson Field Office (see address below).

2. If incidental take does occur, the USDA must cease using the responsible method and reinitiate consultation with the appropriate Field Office (see address below).

U.S. Fish and Wildlife Service
3100 University Blvd., S., Suite 120
Jacksonville, Florida 32216
904/791-2580

U.S. Fish and Wildlife Service
Enhancement - Suite A
6578 Dogwood View Parkway
Jackson, Mississippi 39213
601/965-4900

SAN FRANCISCO GARTER SNAKE (*Thamnophis sirtalis tetrataenia*) - E

BIOLOGICAL OPINION

Status of the Species

The San Francisco garter snake is a slender serpent of the family Colubridae (Fitch 1965). Historically, San Francisco garter snakes occurred in scattered freshwater wetland and pond areas on the San Francisco Peninsula from approximately the San Francisco County line south along the eastern and western bases of the Santa Cruz Mountains, at least to the Upper Crystal Springs Reservoir, and along the coast south to Año Nuevo Point, San Mateo County, and Waddell Creek, Santa Cruz County, California (Barry 1978).

Recent studies have documented garter snake movement over several hundred yards away from wetlands into upland hibernation habitats in small mammal burrows.

Recently confirmed populations of the San Francisco garter snake occur at Año Nuevo State Reserve, Pescadero Marsh Natural Preserve, San Francisco State Fish and Game Refuge (including both lower and upper Crystal Springs Reservoirs), Sharp Park Golf Course (Laguna Salada), Mori Point, Cascade Ranch, and Millbrae (San Francisco Airport). The following reported locations and/or "populations" have not been confirmed as extant by the Service or the California Department of Fish and Game: San Bruno Mountain, Whitehouse Creek, Denniston Creek, La Honda Creek, Colma Creek, San Gregorio Creek, San Mateo Creek, Sanchez Creek, and near Edgewood and Canada Roads. Additional San Francisco garter snakes have been reported from agricultural ponds situated along the immediate coast between Pescadero Point and the Cascade Ranch (USFWS 1985a).

Urban development and road construction, especially in wetlands and adjacent uplands, pose serious threats to the San Francisco garter snake. Channelization of creeks and removal of streamside vegetation by grazing cattle deprive garter snakes of the frogs they prey upon. Five state parks are the only publicly managed areas that today harbor San Francisco garter snakes. None of the two dozen privately owned habitats where they occur is secure (USFWS 1985a).

The recovery plan sets a goal of six populations, each with two hundred adult snakes, surviving for five consecutive years before the species can be reclassified as threatened.

Effects of the Proposed Action

This garter snake uses rodent burrows on a seasonal basis. This subspecies could be harmed if aluminum phosphide, gas cartridges, or other fumigants were used in rodent burrows containing one or more snakes. Its limited geographic distribution suggests the likelihood of exposure to these chemicals may be remote, although some populations occur in and around agricultural lands, notably vegetable truck farms and livestock grazing lands.

BIOLOGICAL OPINION

It is my biological opinion that the ADC Program will not jeopardize the continued existence of the San Francisco garter snake.

INCIDENTAL TAKE STATEMENT

The Service anticipates that one San Francisco garter snake may be taken by fumigants. The Service has determined that this level of impact is not likely to result in jeopardy to the species.

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measure is necessary and appropriate to minimize incidental take of the San Francisco garter snake.

1. Fumigant use should be strictly controlled within the known range of the garter snake.

Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, the ADC must comply with the following terms and conditions, which implement the reasonable and prudent measures described above.

1. Aluminum phosphide, gas cartridges, and other fumigants shall not be used in San Mateo County, California, unless proposals for use are first reviewed and approved by the Fish and Wildlife Service, Office of Fish and Wildlife Enhancement, Sacramento, California.

U.S. Fish and Wildlife Service
2800 Cottage Way, Room E-1803
Sacramento, CA 95825
(916) 978-4613

2. Discovery of one dead or sublethally taken garter snake caused by any of the chemicals requires immediate cessation of its use and reinitiation of consultation on that chemical for the garter snake.

WYOMING TOAD (Bufo hemiophrys baxteri) - E

BIOLOGICAL OPINION

Status of the Species

A glacial relic, the Wyoming toad was separated from its closest relative during the last Ice Age. Historically, the Wyoming toad was restricted to within 30 miles of the city of Laramie, but currently it is known only to inhabit floodplains, ponds, and seepage lakes in the shortgrass communities of the Laramie Basin of Wyoming. Larvae of the toads feed primarily on algae while the adults are primarily insectivorous and opportunistic in their selection of food. It is believed that toads hibernate in rodent burrows. The adult toads emerge from winter dormancy in late May or early June, after daily air temperatures approach 80 degrees fahrenheit. Breeding then begins in warm, shallow floodplain ponds where the eggs are laid. Tadpoles normally complete their transformation to adults by early August.

From the 1940's through the early 1970's, the Wyoming toad was abundant throughout its limited range. Rapid declines were observed in the mid-1970's; by the late 1970's, the Wyoming toad had become rare; and in the

early 80's, only a few individuals were found (Baxter and Stromberg, 1980, Stromberg, 1981, Vankirk, 1980, Baxter et al, 1982, Baxter and Stone, 1985, Lewis et al, 1985). A single healthy population was located in 1987, southwest of Laramie. A total of 7 toads were first discovered and during a second survey in late summer, 57 toads were located. Reasons for the decline of the Wyoming toad are uncertain. Theories include predation, disease, changes in agricultural practices, pesticide usage including baytex (fenthion) for mosquito control, and climatic changes (USFWS 1991c). Since 1988, surveys have revealed that this population appears to be stable. There are no known non-Federal actions that are expected to impact species in the future.

Effects of the Proposed Action

ADC personnel provided no information to the Service on effects to amphibians by the pesticides used by the ADC Program. The Service presently lacks adequate information on the feeding habitats of the Wyoming toad to determine if the aboveground use of these pesticides in the Laramie Basin will affect the survival and recovery of this species. The possibility of toads ingesting or absorbing pesticide baits or residues and being affected or killed is unknown. Toads may hibernate in rodent burrows and could contact strychnine or zinc phosphide-contaminated dead rodents in these burrows. Applicators may inadvertently or intentionally apply baits into rodent burrows, increasing the likelihood of strychnine or zinc phosphide/toad contact. Gas cartridges and aluminum phosphide used to control ground squirrels and other burrowing animals would be likely to kill any Wyoming toads in the burrow.

BIOLOGICAL OPINION

Because this species consists of very few individuals in a very localized population, and because little is known about the effects of grain bait, or the likelihood of mortality from gas cartridges or aluminum phosphide, it is my biological opinion that the use of these materials by the ADC Program is likely to jeopardize the continued existence of the Wyoming toad.

REASONABLE AND PRUDENT ALTERNATIVES

The Section 7 regulations have defined reasonable and prudent alternatives as alternative actions, identified during formal consultation, that can be implemented in a manner consistent with intended purpose of the action, that can be implemented consistent with the scope of the Federal agency's legal authority and jurisdiction, that are economically and technologically feasible, and that the Service believes would avoid the likelihood of jeopardizing the continued existence of listed species or result in the destruction or adverse modification of critical habitat.

As a reasonable and prudent alternative, the Service shall be contacted prior to any ADC work involving toxicants in the Laramie River Basin in Albany County, Wyoming. Strychnine, zinc phosphide, aluminum phosphide,

or gas cartridges shall not be used in areas of the Basin where it is determined by the Service that the Wyoming toad may occur.

Because this biological opinion has found jeopardy, the USDA is required to notify the Service of its final decision on the implementation of the reasonable and prudent alternatives.

INCIDENTAL TAKE STATEMENT

Assuming the implementation of the reasonable and prudent alternative described above, the Service anticipates that the proposed action will not result in any incidental of the Wyoming toad.

Summary Comments

The dynamic nature of the ADC Program demands close coordination with the Service at field, Regional and Central office levels to assure that any incidental take is reported and steps are taken to correct the circumstances that caused it. The Service suggests that annual coordination meetings, involving appropriate Washington staff from the Fish and Wildlife Service and ADC, will serve this purpose.

Further, the Service's central office should receive the annual reports of target and non-target species taken during all operations.

Reinitiation

This concludes formal consultation on the Animal Damage Control Program. Reinitiation of formal consultation is required if the amount or extent of incidental take is exceeded, if new information reveals effects of the action that may impact listed species or critical habitat in a manner or to an extent not considered in this opinion, if the action is subsequently modified in a manner that caused an effect to the listed species or critical habitat that was not considered in this opinion, or if a new species is listed or critical habitat designated that may be affected by the action. If reinitiation is required, the responsible ADC office must immediately reinitiate with the appropriate Fish and Wildlife Service office.

Richard N. Smith

Acting Director, U.S. Fish and Wildlife Service

Enclosure 1

SPECIES WITH "MAY AFFECT" DETERMINATIONS
SUBMITTED BY USDA

Mammals (27)

1. Alabama beach mouse (Peromyscus polionotus ammobates)
2. Black-footed ferret (Mustela nigripes)
3. Brown/grizzly bear (Ursus arctos pruinosus)
4. Carolina northern flying squirrel (Glaucomys sabrinus coloratus)
5. Choctawhachee beach mouse (Peromyscus polionotus alloprys)
6. Columbian white-tailed deer (Odocoileus virginianus leucurus)
7. Delmarva fox squirrel (Sciurus niger cinereus)
8. Eastern cougar (Felis concolor cougar)
9. Florida panther (Felis concolor coryi)
10. Gray bat (Myotis grisescens)
11. Gray wolf (Canis lupis monstrabilis)
12. Indiana bat (Myotis sodalis)
13. Jagarundi (Felis yagouaroundi cacomitli)
14. Morro bay kangaroo rat (Dipodomys heermanni morroensis)
15. Mount Graham red squirrel (Tamiasciurus hudsonicus grahamensis)
16. Ocelot (Felis pardalis)
17. Ozark big-eared bat (Plecotus townsendii ingens)
18. Perdido Key beach mouse (Peromyscus polionotus trissyllepsis)
19. Red wolf (Canis lupus)
20. Salt marsh harvest mouse (Reithrodontomys raviventris)
21. San Joaquin kit fox (Vulpes macrotis nereis)
22. Sonoran pronghorn (Antilocapra americana sonoriensis)
23. Utah prairie dog (Cynomys parvidens)
24. Virginia big-eared bat (Plecotus townsendii virginianus)
25. Virginia northern flying squirrel (Glaucomys sabrinus fuscus)
26. Hualapai Mexican vole (Microtus mexicanus hualpaiensis)
27. Woodland caribou (Rangifer terandus caribou)

Birds (37)

28. Aleutian Canada goose (Granta canadensis leucopareia)
29. American peregrine falcon (Falco peregrinus anatum)
30. Arctic peregrine falcon (Falco peregrinus tundrius)
31. Attwater's greater prairie chicken (Tympanuchus cupido attwateri)
32. Bald eagle (Haliaeetus leucocephalus)
33. Black-capped vireo (Vireo atricapillus)
34. Brown pelican (Pelecanus occidentalis)
35. California clapper rail (Rallus Longerostris obsoletus)
36. California condor (Gymnogyps californianus)
37. California least tern (Sterna albifrons browni)
38. Eskimo curlew (Numenius boralis)
39. Hawaiian common moorhen (Gallinula chloropus sandvicensis)
40. Hawaiian coot (Fulica americana alai)
41. Hawaiian duck (Anas wyvilliana)

42. Hawaiian goose (_Nesochen sandvicensis_)
43. Hawaiian stilt (_Himantopus mexicanus knudseni_)
44. Large Kauai thrush (_Myadestes myadestinus_)
45. Laysan duck (_Anas laysanensis_)
46. Laysan finch (_Telespyza cantans_)
47. Least tern (_Sterna antillarum_)
48. Light-footed clapper rail (_Rallus longirostris levipes_)
49. Masked bobwhite (_Colinus virginianus ridgwayi_)
50. Mississippi sandhill crane (_Grus canadensis pulla_)
51. Molokai thrush (_Myadestes lanaiensis rutha_)
52. Newell's Townsend's shearwater (_Puffinus auricularis newelli_)
53. Nihoa fincha (_Telespyza ultima_)
54. Nihoa millerbird (_Acrocephalus familiaris kingi_)
55. Northern Aplomado falcon (_Falco femoralis septentrionalis_)
56. Piping plover (_Charadrius melodus_)
57. Puerto Rican nightjar (_Caprimulgus noctitherus_)
58. Puerto Rican parrot (_Amazona vittata_)
59. Puerto Rican plain pigeon (_Columba inornata wetmorei_)
60. Roseate tern (_Sterna dougallii_)
61. Small Kauai thrush (_Myadestes palmeri_)
62. Whooping crane (_Grus americana_)
63. Wood stork (_Mycteria americana_)
64. Yellow-shouldered blackbird (_Agelaius xanthomus_)

Reptiles (14)

65. Alabama red-bellied turtle (_Pseudemys alabemensis_)
66. American alligator (_Alligator mississippiensis_)
67. American crocodile (_Crocodulus acutus_)
68. Desert tortoise (_Gopherus agassizii_)
69. Eastern indigo snake (_Drymarchon corais couperi_)
70. Flattened musk turtle (_Sternotherus depressus_)
71. Green sea turtle (_Chelonia mydas_)
72. Hawksbill sea turtle (_Eretmochelys imbricata_)
73. Kemps's Ridley sea turtle (_Lepidochelys kempii_)
74. Leatherback sea turtle (_Dermochelys coriacea_)
75. Loggerhead sea turtle (_Caretta caretta_)
76. Mona boa (_Epicrates monensis monensis_)
77. Mona ground iguana (_Cyclura stejnegeri_)
78. Monito gecko (_Sphaerodactylus micropithecus_)

Amphibians (1)

79. Wyoming toad (_Bufo hemiophrys baxteri_)

Fishes (17)

80. Alabama cavefish (_Speoplatyrhinus poulsoni_)
81. Amber darter (_Percina antesella_)
82. Bayou darter (_Etiostoma rubrum_)

83. Blackside dace (Phoxinus cumberlandensis)
84. Cape Fear shiner (Notropis mekistocholas)
85. Fountain darter (Etheostoma fonticola)
86. Leopard darter (Percina pantherina)
87. Ozark cavefish (Amblyopsis rosae)
88. San Marcos gambusia (Gambusia georgei)
89. Shortnose sturgeon (Acipenser brevirostrum)
90. Waccamaw silverside (Menidia extensa)
91. Slackwater darter (Eitheostoma boschungi)
92. Slender chub (Hybopsis monacha)
93. Smoky madtom (Noturus baileyi)
94. Snail darter (Percina tanasi)
95. Spotfin chub (Hybopsis monacha)
96. Yellowfin madtom (Noturus flavipinnis)

Clams (25)

97. Alabama lamp pearly mussel (Lampsilis virescens)
98. Appalachian monkeyface pearly mussel (Quadrula sparsa)
99. Birdwing pearly mussel (Conradilla caelata)
100. Cumberland bean pearly mussel (Villasa [=Micromya] trabilio)
101. Cumberland monkeyface pearly mussel (Quadrula intermedia)
102. Curtis' pearly mussel (Epioblasma [=Dysnomia] florentine curtisi)
103. Curtus' mussel (Pleurobema curtum)
104. Dromedary pearly mussel (Dromus dromus)
105. Fat pocketbook (Potamilus [=Proptera] capax)
106. Fine-rayed pigtoe pearly mussel (Fusconaia coneolus)
107. Green-blossom pearly mussel (Epioblasma [Disnomia] torulosa gubernaculum)
108. Judge Tait's mussel (Pleurobema taitianum)
109. Louisiana pearlshell (Margaritifera hembeli)
110. Orange footed pimpleback pearly mussel (Plethobasis cooperianus)
111. Pale lilliput pearly mussel (Toxolasma [=Crunculina cylindrella)
112. Pink mucket pearly mussel (Lampsillis orbiculata orbiculata)
113. Rough pigtoe (Pleurobema plenum)
114. Shiny pigtoe pearly mussel (Fusconoin edgariana)
115. Stirrup shell (Quadrula stapes)
116. Tan riffle shell (Epioblasma walkeri)
117. Tar River spinymussel (Elliptio steinstansana)
118. Tuberculed-blossom pearly mussel (Epioblasma [=Dysnomia] torulosa torulosa)
119. Turgid blossom pearly mussel (Epioblasma [=Dysnomia] turgidula)
120. White warty-back pearly mussel (Plethobasis cicatricosus)
121. Yellow-blossom pearly mussel (Epioblasma [=Dysnomia] florentina florentina)

Crustaceans (2)

122. Cave crayfish (Cambarus zophonastes)
123. Nashville crayfish (Orconectes shoupi)

Plants (21)

124. Aconitum noveboracense
125. Arenaria cumberlandensis
126. Baptisia arachnifera
127. Betula uber
128. Echinacea tennesseensis
129. Isotria medeoloides
130. Lindera melissifolia
131. Lysimachia asperulaefolia
132. Oxypolis canbyi
133. Penstemon haydenii
134. Pityopsis ruthii
135. Sagittaria fasciculata
136. Sarracenia oreophila
137. Sarracenia rubra
138. Sarracenia alabamenesis
139. Scutellaria montana
140. Solidago albopilosa
141. Solidago shortii
142. Solidago spithamaea
143. Trifolium stoloniferum
144. Zizania texana

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Appendix G

Public Scoping

Appendix G

Public Scoping

Table of Contents

Postscoping Document

Summary of Public Comments

Made During Scoping Procedures for the

Animal Damage Control

Programmatic Environmental Impact Statement

Docket No. 87-151

U.S. Department of Agriculture
Animal and Plant Health Inspection Service
Animal Damage Control

January 25, 1988

Introduction

On November 16, 1987, the Animal and Plant Health Inspection Service (APHIS), U.S. Department of Agriculture (USDA), advised the public that a new environmental impact statement (EIS) would be prepared on the Federal/Cooperative Animal Damage Control (ADC) program. The initial step in the EIS development is scoping (i.e., determining the scope of issues to be addressed). The objectives of the APHIS ADC scoping process were (1) to facilitate an efficient EIS preparation process, (2) to define the issues, concerns, and alternatives that will be examined in detail, and (3) to save time in the overall process by helping to ensure the draft statement adequately addresses relevant issues. In the *Federal Register* notice (52 FR 43778, November 16, 1987), APHIS solicited public involvement in the scoping process in the form of either written or oral comments. Three scoping meetings were held: (1) on December 15, 1987, in Sacramento, CA, (2) on December 17, 1987, in Kansas City, MO, and (3) on December 21, 1987, in Washington, DC. Written comments were to be addressed to the Assistant Director, Regulatory Coordination, APHIS, Hyattsville, MD. The published deadline for receipt of written comments was January 20, 1988.

This report summarizes comments received by APHIS in response to its November 16, 1987, *Federal Register* notice. More specifically, the report addresses comments made by all 17 speakers at the public scoping meetings and written comments 1 through 251 as logged in at the Regulatory Coordination office (Table G-1). Comments from cooperating agencies were not received by January 20, 1988, and are not included in this summary. To accomplish a thorough and expeditious review of public comments, the

Table G-1

Numbers of Oral and Written Statements Submitted for the APHIS ADC Program EIS Scoping, APHIS Docket No. 87-151

Categories of Respondents	Number of Statements	Percent of Total
Organizations		
Livestock producer associations	13	6
Other agricultural groups	15	7
Conservation, preservation, humane, and animal rights groups	18	8
Association of county agricultural commissioners	1	0.5
Government Agencies		
Federal	3	1
State	11	5
County and local	2	1
Individuals		
Ranchers and farmers	12	6
Persons responding to Defenders of Wildlife action alert	115	54
Environmental contractor	1	0.5
Newspaper	1	0.5
Others	22	10

[a] This total differs from the total number of written comments logged in by the Regulatory Coordination staff because a petition received was treated as one response by the scoping group, whereas the Regulatory Coordination staff considered each signature on the petition as a separate response.

APHIS ADC program appointed a special EIS Scoping Work Group that included four professionals representing field operations, research, and headquarters staff. Members of the scoping group attended the December 1987 public scoping meetings to hear firsthand the views expressed there. The scoping group met at Hyattsville, MD, from January 20, 1988, through January 25, 1988, to study and discuss all oral and written comments and to prepare this summary report.

Each written statement and the court recorder's transcript of oral statements were systematically searched for the following kinds of information:

1. Reactions to the four EIS alternatives listed in APHIS' November 16, 1987, *Federal Register* notice.
2. Other alternatives that writers or speakers clearly intended for consideration as EIS alternatives.
3. Issues and concerns that respondents asked to have addressed in the EIS.
4. Other statements.

Responses in each of these categories are summarized in the body of this report. The scoping group attempted to summarize public comments as objectively as possible, but an exhaustive list of all points raised by each respondent was not made as the original documents will continue to be available to all interested parties. Judgments as to which comments and issues should be included in the Draft Environmental Impact Statement (DEIS) were beyond the assignment of the scoping group. These decisions will be made by Agency representatives later in the EIS process.

Summary of Public Comments

Federal Register Alternatives 1 through 4

The *Federal Register* notice (52 FR 43778, November 16, 1987) identified four alternatives proposed for evaluation in the EIS:

1. The current control program.
2. No action (i.e., no Federal APHIS ADC program).
3. Eradication program (i.e., planned elimination of pest wildlife populations in designated areas).
4. Suppression program (i.e., planned, long-term reduction of pest wildlife populations in designated areas).

Specific public expressions of support or opposition to these alternatives were tallied (Table G-2). Many respondents made comments that could have been interpreted to mean that the writer supported or opposed various alternatives, but the scoping group did not make such interpretations. Table G-2 includes counts of only those statements clearly supporting or opposing the alternatives.

Strong support and strong opposition were expressed for alternative 1. No one supported alternative 2. Alternatives 3 and 4 were more opposed than supported, and most expressions of support were qualified.

Table G-2

Numbers of Persons and Organizations That Expressed Support for or Opposition to APHIS ADC Program Proposed EIS Alternatives 1 Through 4

Alternative	Support	Oppose	Total
1. Current Program	33	25	58
2. No Federal Program	0	31	31
3. Eradication Program	8	31	39
4. Suppression Program	10	29	39

Other Alternatives Suggested

A number of alternatives were suggested during the public scoping period for the EIS. Only those alternatives that the writer clearly intended for consideration as EIS alternatives are listed here. Their appropriateness for treatment in the EIS was not evaluated.

1. Convert operational assistance programs to educational assistance, including transfer of all funds to the Extension Service (ES), USDA.
2. Reduce Federal manpower and transfer Federal control operations to private contractors.
3. Transfer the current Federal/cooperative control program to state wildlife agencies, including funds.
4. Continue western coyote control programs in APHIS, and return eastern bird work to the U.S. Fish and Wildlife Service (USFWS), U.S. Department of Interior (USDI).
5. Expand the current program (Alternative 1 in the *Federal Register* notice) to include published Alternatives 3 and 4 for certain species in certain areas.

Issues Suggested

1. Establish a cooperative relationship with ES to educate producers in predator deterrence and control.
2. Require each producer to have certain livestock husbandry practices in place in order to qualify for APHIS ADC program services.
3. Target for control only the offending individuals.
4. Incorporate the use of predator deterrents such as guard dogs in all alternatives.
5. Expand the current program with additional funding for operations and research.
6. Livetrap and relocate problem predators.

Concerns Requested to be Addressed in the EIS

Respondents raised the following concerns that were not identified as EIS alternatives or issues but were offered as topics requiring consideration in the EIS:

1. More sheep are produced in eastern farm flocks than on western rangelands; discuss and analyze this as it relates to predator deterrence and control.
2. Provide detailed information about APHIS ADC program activities since the finalization of the 1979 EIS, including target and nontarget take by year, species, and method.
3. Discuss changes in target species populations and threats other than APHIS ADC to these species.
4. Analyze the effectiveness of all control methods.
5. Provide information on past and present APHIS ADC funding and expenditures.
6. Discuss rodent and bird control methods, including effectiveness and impact on target and nontarget populations and future needs.
7. Provide information about livestock losses to predators since the 1979 EIS.
8. Discuss control of marine birds to protect fishery resources.
9. Discuss continuing APHIS ADC assistance to airports.
10. Address the need for continued response to nonagricultural wildlife damage problems.
11. The EIS should provide policy and guidance to the APHIS ADC program.
12. Clarify legal authority, both State and Federal, for the control of various species and how APHIS operates within this framework.
13. Recognize the objections of over 75 percent of the American public to the use of steel-jawed traps.
14. Discuss the cost effectiveness of coyote control.
15. Publish USDA's goals for the APHIS ADC program.
16. Provide an analysis of the justification of the APHIS ADC program.
17. Assess the cost effectiveness of each alternative.
18. Evaluate the economic impact of wildlife damage on affected industries, rural communities, and consumers.
19. Benefits of APHIS ADC to beneficial wildlife are not adequately recognized.
20. Nonlethal techniques that should be evaluated include guard dogs, adverse conditioning, management of damaging wildlife populations through fertility control, and encouraging good livestock husbandry practices.
21. Both incentives and disincentives should be used to encourage sound ranching practices.
22. A public education program should be developed to explain to the public the needs for and roles of APHIS ADC. Emphasis should be placed on explaining how some species thrive and create problems in environments modified by man.

Other Statements

1. Loss to predators is the major cause for the decline of the sheep industry.
2. Indirect impacts of wildlife damage and control of damage have not been adequately measured or given adequate consideration.
3. APHIS ADC benefits a minority of people, some of whom unfairly exploit public resources for personal gain.
4. APHIS ADC does not have adequate funding or staff.
5. Operational APHIS ADC is necessary because individual livestock and crop producers do not have adequate resources to conduct wildlife damage control, and many producers would fail if operational APHIS ADC were terminated.
6. APHIS ADC puts most of its resources into predator control; yet greater damage is caused by rodents and birds than by predators.
7. APHIS ADC emphasizes lethal techniques over nonlethal techniques that may be effective in reducing damage.
8. Loss of chemical control tools necessitates use of other more costly control techniques, but program funding has not increased accordingly.
9. APHIS ADC is not effective in protecting livestock producers from losses to predators, and many segments of American agriculture receive no protection from damaging wildlife.
10. Control cost per coyote taken is high because of the difficulty of identifying and taking offending individuals.
11. APHIS ADC moves too slowly in adopting nonlethal control techniques.
12. APHIS ADC is not truthful in reporting numbers of nontarget animals killed.
13. Many control techniques now employed are inhumane.
14. Research is needed to develop safer, more economical, and more efficient control techniques. Tools now available are not adequate and some of these are likely to be lost.
15. Use of toxicants for damage control adversely affects the environment.
16. Wilderness values are reduced by conducting wildlife control operations within established wilderness areas.
17. Management of public lands should emphasize wildlife enhancement and recreation rather than livestock production.
18. Once a damage problem is corrected, emphasis should be placed on preventing the reoccurrence of the damage and reinvasion by damaging wildlife.
19. Game management agencies need to better regulate game animal populations that have substantial negative impacts on agriculture.
20. Wild animals not responsible for damage are often killed in attempts to reduce losses.
21. APHIS ADC contributes to the decline of some threatened and endangered species.
22. Because they are not native, introduced species such as monk parakeets may be targeted for control without consideration of their positive values.
23. Control of predator populations may result in dramatic increases in prey species that in turn adversely impact the environment and agricultural industries.

24. APHIS ADC is critical to maintaining wildlife habitat because without it some farmers would fail and lands they use would be sold for commercial development or otherwise allowed to deteriorate as wildlife habitat.

25. APHIS ADC program funds currently devoted to livestock protection should not be diverted to other APHIS ADC activities.

26. APHIS ADC programs do not provide an equitable allocation of services.

27. Time allocated for public comment during scoping was not adequate.

Appendix H

Target and Nontarget Species Captured and Destroyed or Released by the APHIS ADC Program, FY 1988

Appendix H

Table H-1

Target and Nontarget Species Captured and Destroyed or Released by the APHIS ADC Program, FY 1988

No animals were killed in the following states in FY 1988:

Connecticut	Missouri
Delaware	North Carolina
Florida	Rhode Island
Iowa	South Carolina
Kansas	Vermont
Maine	Virginia
Maryland	West Virginia
Massachusetts	District of Columbia
Michigan	

Summary kill tables for the rest of the States follow.

Alabama (FY 1988)

Species	Shooting	*Target Species* Destroyed	Released	*Nontarget Species* Destroyed	Released
Birds					
Cormorant, double-crested	3	3	0	0	0
Heron, great blue	1	1	0	0	0
Totals	4	4	0	0	0

Alaska (FY 1987[a])

Species	Leghold Trap	Calling and Shooting	Cage Traps	*Target Species* Destroyed	Released	*Nontarget Species* Destroyed	Released
Mammals							
Fox, arctic	7	2		9	0	0	0
Fox, red	2			2	0	0	0
Otter, river	3				0	0	3
Squirrel, red			4		4	0	0
Totals	12	2	4	11	4	0	3

[a]FY 1987 data are used because FY 1988 data are unavailable.

Source: USDA APHIS ADC program annual State reports (FY 1988).

Table H-1 (Continued)

Target and Nontarget Species Captured and Destroyed or Released by the APHIS ADC Program, FY 1988

Arizona (FY 1988)

Species	Leghold Trap	M-44	Snare	Calling and Shooting	Heli-copter	Cage Trap
Mammals						
Badger	27					
Bear, black	1		5			
Beaver						
Bobcat	12					
Cat, domestic						35
Coati	1					
Coyote	928	145	1	87	174	
Deer species			1			
Dog, domestic	101			21		
Fox, gray	27					
Fox, kit	4					
Hog, feral	1					
Jackrabbit species	1					
Mountain lion	6		8			
Peccary (javelina)	13		8			1
Porcupine	7					
Raccoon	10		1			
Skunk, spotted	3					
Skunk, striped	48			2		17
Squirrel, ground species						1
Birds						
Blackbird/European starling[a]						
Owl species				1		
Pigeon (rock dove)						1,000
Raven species				74		
Woodpecker species				1		
Totals	1,190	145	24	186	174	1,054

[a] Blackbirds and starlings killed were reported together. An estimated 16 percent of the birds in blackbird roosts are starlings (Stickley, A.R., Jr., Personal communication, October 2, 1989). Based on this percentage, an estimated 89,458 blackbirds and 17,040 starlings were killed.

Arizona (FY 1988)

DRC-1339	Propane Exploder	Conibear Trap	*Target Species* Destroyed	*Target Species* Released	*Nontarget Species* Destroyed	*Nontarget Species* Released
			18	0	0	9
			6	0	0	0
		1	1	0	0	0
			0	7	0	5
			35	0	0	0
			0	0	0	1
			1,335	0	0	0
			0	0	1	0
			88	1	10	23
			3	8	4	12
			0	0	0	4
			0	0	1	0
			0	0	1	0
			14	0	0	0
			0	7	1	14
			0	0	7	0
			1	1	4	5
			3	0	0	0
			67	0	0	0
			0	0	0	1
106,498			106,498	0	0	0
			1	0	0	0
			0	1,000	0	0
	300		74	300	0	0
			1	0	0	0
106,498	300	1	108,145	1,324	29	74

Table H-1 (Continued)

Target and Nontarget Species Captured and Destroyed or Released by the APHIS ADC Program, FY 1988

Arkansas (FY 1988)

Species[a]	Shooting	Target Species Destroyed	Target Species Released	Nontarget Species Destroyed	Nontarget Species Released
Birds					
Egret, cattle	4	4	0	0	0
Egret, great	55	55	0	0	0
Egret, snowy	32	32	0	0	0
Grebe, pied-billed	4	4	0	0	0
Heron, black-crowned night	7	7	0	0	0
Heron ,great blue	18	18	0	0	0
Heron, green	6	6	0	0	0
Heron, little blue	82	82	0	0	0
Pelican, white	1	1	0	0	0
Totals	209	209	0	0	0

[a] Collected for food-habits study at minnow/fish ponds where depredation has been reported.

Colorado (FY 1988)

Species	Fixed Wing	Heli-copter	M-44	Cage Trap	Leg-hold Trap	Snare	Den-ning
Mammals							
Badger					27	4	
Bear, black						3	
Beaver					7	3	
Bobcat					3		
Cat, domestic				6			
Coyote	1,327	197	221		268	197	394
Dog, domestic						3	
Fox, red			1		16		8
Mountain lion					1	4	
Porcupine					1	1	
Raccoon				41	7	2	
Skunk, striped				75	38	5	
Totals	1,327	197	222	122	368	222	402

Colorado (FY 1988)

Calling and Shooting	Shooting	Hunting Dogs	*Target Species* Destroyed	*Target Species* Released	*Nontarget Species* Destroyed	*Nontarget Species* Released
			21	0	4	6
		10	13	0	0	0
			10	0	0	0
			2	0	1	0
			6	0	0	0
295	113	51	3,063	0	0	0
			3	0	0	0
	1		25	0	1	0
	1	7	13	0	0	0
	11		11	0	2	0
		6	52	0	4	0
	1		111	0	8	0
295	127	74	3,330	0	20	6

Table H-1 (Continued)

Target and Nontarget Species Captured and Destroyed or Released by the APHIS ADC Program, FY 1988

California (FY 1988)

Species	M-44	Cage Trap	Leghold Trap	Snare	Den-ning	Calling and Shooting
Mammals						
Badger			232	2		
Bear, black		6	3	16		
Beaver		2	27	57		
Boar, Russian			16	5		
Bobcat		32	193	3		2
Cat, domestic		282	28			
Coyote	661	3	3,924	744	572	555
Deer species				1		
Dog, domestic	3	3	133	25		
Fox, gray	21	178	145	4		
Fox, red	1	13	101	2		
Hog, feral			16	21		
Jackrabbit species		1	1			
Mink			2	1		
Mountain lion		3	2	6		
Muskrat			2			
Opossum		2,161	88	2		
Otter, river			1			
Porcupine		3	58	3		
Raccoon	12	2,666	287	37		
Ringtail		5				
Skunk, striped	2	4,952	688	18		
Squirrel, ground species		48				
Weasel species		1				
Woodrat species (packrat)						
Birds						
Crow						
Hawk/Falcon species			1			
Heron species						
Pigeon (rock dove)		8				
Raven species						
Totals	703	10,265	5,948	947	572	557

California (FY 1988)

Shooting	Hunting Dogs	Other	*Target Species* Destroyed	*Target Species* Released	*Nontarget Species* Destroyed	*Nontarget Species* Released
15		55	186	4	86	28
1	14		34	2	1	2
147			232	0	0	0
3			9	0	0	15
2	2	1	42	77	5	96
3			162	16	1	51
1,198	101	10	7,769	0	0	0
			0	0	0	1
1		1	1	19	10	136
4		3	108	119	47	81
		1	96	2	3	17
			1	0	0	36
30			30	0	1	1
			1	0	3	0
2	19		30	0	2	0
6			7	0	1	0
1		84	1,953	328	46	9
			1	0	0	0
31			76	1	18	0
17	2	35	1,474	1,419	83	80
			0	1	0	4
195	1	74	5,927	1	2	0
		135	183	0	0	0
			0	0	1	0
			0	0	0	0
15			15	0	0	0
24		1	26	0	0	0
3			3	0	0	0
			3	5	0	0
8			8	0	0	0
1,706	139	400	18,377	1,994	309	557

Table H-1 (Continued)

Target and Nontarget Species Captured and Destroyed or Released by the APHIS ADC Program, FY 1988

Georgia (FY 1988)

Species	Trapping	Shooting	Other	Target Species Destroyed	Target Species Released	Nontarget Species Destroyed	Nontarget Species Released
Mammals							
Beaver	19			19	0	0	0
Cat, domestic	4			0	0	4	0
Deer species		2		2	0	0	0
Monkey, rhesus[a]	2			0	2	0	0
Opossum	5			5	0	0	0
Rabbit, cottontail		3		3	0	0	0
Raccoon	25			16	8	0	1
Skunk, striped	1	1		2	0	0	0
Squirrel, gray	3			3	0	0	0
Birds							
Blackbird group[b]	50		30	80	0	0	0
Crow, fish	30		50	80	0	0	0
Goose, Canada	3			0	3	0	0
Mallard	8	1		1	8	0	0
Thrasher, pearly-eyed[a]	1			0	0	1	0
Other Species							
Turtle, snapping	10			0	0	8	2
Totals	161	7	80	211	21	13	3

[a] Species were captured or released during APHIS ADC program activity in Puerto Rico.
[b] Includes blackbirds, cowbirds, and grackles.

Idaho (FY 1988)

Species	Fixed Wing	Heli-copter	M-44	Leghold Trap	Snare	Den-ning
Mammals						
Badger				12		
Bear, black					33	
Bear, grizzly					3	
Bobcat				5		
Coyote	1,332	725	197	841	65	68
Dog, domestic				7		
Fox, red			23	36	2	
Mountain lion				3		
Raccoon				1		
Totals	1,332	725	220	905	103	68

Hawaii (FY 1988)

Species	Cage Trap	Snare	Shoot- ing	*Target Species* Destroyed	*Target Species* Released	*Nontarget Species* Destroyed	*Nontarget Species* Released
Mammals							
Rabbit species		2		0	0	2	0
Rat species	51			51	0	0	0
Birds							
Albatross	146			0	146	0	0
Egret, cattle			6,616	6,616	0	0	0
Mannikin, nutmeg			2	2	0	0	0
Upland game birds	354		290	290	354	0	0
Totals	551	2	6,908	6,959	500	2	0

Idaho (FY 1988)

Calling and Shooting	Shoot- ing	Hunting Dog	*Target Species* Destroyed	*Target Species* Released	*Nontarget Species* Destroyed	*Nontarget Species* Released
			0	0	11	1
			32	0	0	1
			0	2	0	1
			1	0	1	3
359	61		3,648	0	0	0
			4	0	0	3
	1		21	0	31	10
		1	4	0	0	0
			0	0	1	0
359	62	1	3,710	2	44	19

Table H-1 (Continued)

Target and Nontarget Species Captured and Destroyed or Released by the APHIS ADC Program, FY 1988

Illinois (FY 1988)

Species	Snare	Leg-hold	Net	Target Species Destroyed	Target Species Released	Nontarget Species Destroyed	Nontarget Species Released
Mammals							
Cat, domestic		1		0	0	1	0
Coyote	22	2		24	0	0	0
Dog, domestic	1			1	0	0	0
Opossum		1		0	0	1	0
Rabbit species	1			0	0	0	1
Sheep	1	1		0	0	0	2
Birds							
Goose, Canada			1,200	0	1,200	0	0
Totals	25	5	1,200	25	1,200	2	3

Indiana (FY 1988)

Species	Cage Trap	Conibear Trap	Snare	Shoot-ing	Target Species Destroyed	Target Species Released	Nontarget Species Destroyed	Nontarget Species Released
Mammals								
Beaver		8			8	0	0	0
Dog, domestic			1	2	3	0	0	0
Muskrat		8			8	0	0	0
Opossum	4				0	2	0	2
Raccoon	3				0	3	0	0
Woodchuck	39				0	39	0	0
Birds								
Goose, Canada	1,000				0	1,000[a]	0	0
Other Species								
Fish, unidentified		1			0	0	1	0
Turtle, snapping		1			0	0	1	0
Totals	1,046	18	1	2	19	1,044	2	2

[a] Coordinated USFWS permits allowed Indiana Department of Natural Resources to trap and relocate approximately 1,000 geese in Indiana.

Kentucky/Tennessee[a] (FY 1988)

Species	Conibear Trap/ Snare	Cage Traps	PA-14	Target Species Destroyed	Target Species Released	Nontarget Species Destroyed	Nontarget Species Released
Mammals							
Beaver	282			282	0	0	0
Muskrat	10			0	0	6	4
Otter, river	4			0	0	4[b]	0
Raccoon	9			0	0	5	4
Birds							
Blackbird/Starling[c]			3,953,000	3,953,000[d]	0	0	0
Duck species		36		0	36	0	0
Goose, Canada		1,201		0	1,201	0	0
Robin			1	0	0	1	0
Other Species							
Turtle species	33			0	0	33[e]	0[e]
Totals	338	1,237	3,953,001	3,953,282	1,237	49	8

[a] Kentucky and Tennessee programs are combined under one state director; data for both States are reported together.
[b] The otters were killed in Tennessee.
[c] Includes blackbirds, brown-headed cowbirds, grackles, and starlings.
[d] 480,000 birds were killed in Tennessee and 3,473,000 were killed in Kentucky. Species composition of blackbirds (including cowbirds and grackels) in blackbird roosts with starlings is 84 percent (Stickley, A.R., Jr., Personal communication, October 2, 1989); thus, estimated blackbird totals are 403,200 (Tennessee) and 2,917,320 (Kentucky), and estimated starling totals are 632,480 (Tennessee and Kentucky).
[e] An unknown number of turtles were released.

Louisiana (FY 1988)

Species	Strych-nine	Zinc Phos-phide	Gas Car-tridge	Traps/ Snares	Shoot-ing	Target Species Destroyed	Target Species Released	Nontarget Species Destroyed	Nontarget Species Released
Mammals									
Beaver				19		19	0	0	0
Coyote				1		1	0	0	0
Nutria				6		6	0	0	0
Rat, roof		80				80	0	0	0
Skunk species			33	3		30	0	0	0
Birds									
Blackbird group	1					0	0	1	0
Egret, snowy					5	5	0	0	0
Meadowlark, Eastern	1					0	0	1	0
Pigeon (rock dove)	75					75	0	0	0
Woodpecker, pileated					1	1	0	0	0
Other Species									
Alligator				1					1
Turtle species				3				1	2
Totals	77	80	33	33	6	217	0	3	3

Table H-1 (Continued)

Target and Nontarget Species Captured and Destroyed or Released by the APHIS ADC Program, FY 1988

Minnesota (FY 1988)

Species	Leghold Trap	*Target Species* Destroyed	*Target Species* Released	*Nontarget Species* Destroyed	*Nontarget Species* Released
Mammals					
Badger	1	0	0	0	1
Bear, black	2	0	0	0	2
Bobcat	3	0	0	0	3
Coyote	17	0	0	17	0
Fox, red	34	0	0	10	24
Raccoon	22	0	0	5	17
Skunk species[a]	12	0	0	12	0
Wolf, gray (timber)	58	53	5	0	0
Other mammals	8	0	0	0	8
Totals	157	53	5	44	55

[a] Category primarily represented by striped skunk, but could contain spotted skunk.

Montana (FY 1988)

Species	Fixed Wing	Heli-copter	M-44	Leghold Trap	Cage Trap
Mammals					
Badger				35	
Bear, black					
Bear, grizzly					2
Bobcat			1	2	
Coyote	728	1,455	626	513	
Dog, domestic			2	1	
Fox, red	46	61	223		
Mountain lion					
Porcupine				8	
Raccoon					
Skunk, striped			2		
Totals	774	1,516	854	559	2

Mississippi (FY 1988)

Species	Trapping	Shoot-ing	Net	PA-14	DRC-1339	*Target Species* Destroyed	Released	*Nontarget Species* Destroyed	Released
Mammals									
Beaver	64	20				84	0	0	0
Coyote		2				2	0	0	0
Muskrat	4					2	0	2	0
Nutria	2	12				14	0	0	0
Otter, river	1					0	0	1	0
Birds									
Blackbird group[a]				15,000		15,000	0	0	0
Cormorant, double-crested		24				24	0	0	0
Duck, Muscovy		2	23			2	23	0	0
Egret, great		16				16	0	0	0
Egret, snowy		1				1	0	0	0
Grebe, horned		1				1	0	0	0
Heron, great blue		13				13	0	0	0
Kingfisher, belted	1					0	0	1	0
Starling					300	300	0	0	0
Other Species									
Alligator	2					0	0	2	0
Turtle species	16					0	0	4	12
Totals	90	91	23	15,000	300	15,459	23	10	12

[a] Includes blackbirds, cowbirds, and grackles.

Montana (FY 1988)

Snare	Den-ning	Shooting	*Target Species* Destroyed	Released	*Nontarget Species* Destroyed	Released
1			36	0	0	0
34		2	36	0	0	0
1			0	1	0	2
			3	0	0	0
454	191	426	4,393	0	0	0
			3	0	0	0
114	100	46	590	0	0	0
		3	3	0	0	0
2			0	0	10	0
1			1	0	0	0
		1	3	0	0	0
607	291	478	5,068	1	10	2

Table H-1 (Continued)

Target and Nontarget Species Captured and Destroyed or Released by the APHIS ADC Program, FY 1988

Nebraska (FY 1988)

Species	Fixed Wing[a]	M-44	Cage Trap	Leg-hold Trap	Snare	Denning
Mammals						
Badger				57	1	1
Beaver						
Bobcat				1		
Cat, domestic			1	2		
Coyote	134	936		275	33	77
Dog, domestic		1		2		
Fox, red		18		37		19
Jackrabbit species						
Muskrat						
Opossum		5	30	24		
Porcupine				8	1	
Raccoon		1	49	105	6	
Skunk species[b]		18	60	92	2	1
Squirrel, fox			13			
Totals	134	979	153	603	43	98

[a] Hours Flown — Fixed-wing: 143 hours.
[b] Category primarily represented by striped skunk, but could contain spotted skunk.

Nevada (FY 1988)

Species	Fixed Wing	Heli-copter	M-44	Cage Trap	Leg-hold Trap	Snare	Denning
Mammals							
Badger					78		
Bobcat					13		
Coyote	2,429	454	96		1,106	62	185
Fox, kit					17		
Mountain lion						1	
Raccoon				2			
Skunk, striped				24			
Beaver					8	2	
Birds							
Raven species							
Totals	2,429	454	96	26	1,222	65	185

Nebraska (FY 1988)

Calling and Shooting	Shoot-ing	Coni-bear Trap	Target Species Destroyed	Target Species Released	Nontarget Species Destroyed	Nontarget Species Released
	1		36	0	5	19
		26	26	0	0	0
			0	0	0	1
			0	0	1	2
30	53		1,538	0	0	0
			0	0	2	1
	3		77	0	0	0
	98		98	0	0	0
		20	20	0	0	0
			34	5	14	6
			9	0	0	0
			75	63	11	12
	7		180	0	0	0
			0	13	0	0
30	162	46	2,093	81	33	41

Nevada (FY 1988)

Calling and Shooting	Shoot-ing	Hunting Dogs	Target Species Destroyed	Target Species Released	Nontarget Species Destroyed	Nontarget Species Released
			0	0	62	16
			1	0	2	10
186	234	30	4,782	0	0	0
1			1	0	11	6
	1	39	41	0	0	0
			1	0	0	1
			24	0	0	0
			10	0	0	0
	109		109	0	0	0
187	344	69	4,969	0	75	33

Table H-1 (Continued)

Target and Nontarget Species Captured and Destroyed or Released by the APHIS ADC Program, FY 1988

New Hampshire/Vermont[a] (FY 1988)

Species	Cage Trap	Snare	Net	*Target Species* Destroyed	*Target Species* Released	*Nontarget Species* Destroyed	*Nontarget Species* Released
Mammals							
Bear, black	4	1		0	5	0	0
Birds							
Sparrow, house[a]			20	20	0	0	0
Starling[b]			10	10	0	0	0
Totals	4	1	30	30	5	0	0

[a] New Hampshire and Vermont programs are combined under one State director; during FY 1988 animals were killed by the APHIS ADC program only in New Hampshire.
[b] Birds killed during an avian tuberculin study at a dairy farm in New Hampshire.

North Dakota (FY 1988)

Species	Fixed Wing	Coni-bear Trap	M-44	Cage Trap	Leg-hold Trap	Snare	Den-ning
Mammals							
Badger					40	1	
Beaver		289		35	6	22	
Bobcat					3		
Coyote	1,272		223	2	295	181	95
Deer species						2	
Dog, domestic			1				
Fox, red	8		137	2	225	58	55
Mink				2			
Muskrat		1		3			
Porcupine					10	1	
Raccoon		19	2	48	55	13	
Skunk species[a]		1		17	104	8	2
Squirrel species				2			
Birds							
Blackbirds	246,000						
Totals	247,280	310	363	111	738	286	152

[a] Category primarily represented by striped skunk, but could contain spotted skunk.

New York (FY 1988)

Species	Leghold Trap	Calling and Shooting	*Target Species* Destroyed	*Target Species* Released	*Nontarget Species* Destroyed	*Nontarget Species* Released
Mammals						
Coyote	1	1	2	0	0	0
Fox, gray	2		0	0	0	2
Fox, red	5		0	0	0	5
Opossum	15		0	0	2	13
Raccoon	39		0	0	0	39
Skunk, striped	1		0	0	1	0
Totals	63	1	2	0	3	59

North Dakota (FY 1988)

Calling and Shooting	Shoot- ing	Hunting Dogs	Other	*Target Species* Destroyed	*Target Species* Released	*Nontarget Species* Destroyed	*Nontarget Species* Released
				7	0	33	1
	135			486	0	0	1
				2	0	0	1
34	18	4		2,124	0	0	0
				0	0	2	0
				0	0	1	0
3	15	4		434	0	64	9
				2	0	0	0
				2	0	2	0
				2	0	9	0
		1	5	94	0	43	6
				132	0	0	0
				0	0	0	2
				246,000	0	0	0
37	168	9	5	3,375	0	154	20

H Appendix

Table H-1 (Continued)

Target and Nontarget Species Captured and Destroyed or Released by the APHIS ADC Program, FY 1988

New Mexico (FY 1988)

Species	Fixed Wing	Heli-copter	M-44	Leg-hold Trap	Snare	Denning	Calling and Shooting
Mammals							
Badger			3	160	12		
Bear, black			1				
Beaver				2	4		
Bobcat				71	8		1
Cat, domestic				6			
Coyote	1,208	13	1,508	1,260	641	33	218
Deer species				12	44		
Dog, domestic			65	35	7		
Fox, gray			62	81	8		
Fox, kit			48	83	7		
Fox, red			2	4	1		
Fox, swift			4	4			
Jackrabbit species				47	10		
Mountain lion				4	5		
Muskrat							
Peccary (javelina)				1			
Porcupine			1	250	142		
Prairie dog species							
Pronghorn (antelope)				4			
Rabbit, cottontail				10			
Raccoon			1	68	1		
Rat, Norway							
Skunk, hognosed				7			
Skunk, spotted			2	6			
Skunk, striped			23	457	2		
Squirrel, ground species							
Vole species							
Birds							
Crow			4	5			
Pigeon (rock dove)							
Quail species							
Raven species			1				
Vulture species				11			
Totals	1,208	13	1,725	2,588	892	33	219

New Mexico (FY 1988)

Shooting	Hunting Dogs	Cage Trap	Other	Target Species Destroyed	Target Species Released	Nontarget Species Destroyed	Nontarget Species Released
				8	1	132	34
				0	0	1	0
1			99	106	0	0	0
1				68	0	7	6
		13		0	13	0	6
117	5			5,003	0	0	0
				0	0	47	9
				0	1	104	2
				3	1	117	30
				2	0	102	34
				0	0	7	0
				0	0	5	3
				0	0	55	2
				8	0	0	1
			4	4	0	0	0
				0	0	0	1
				9	0	376	8
92				92	0	0	0
				0	0	3	1
				0	0	10	0
		4	4	39	2	33	4
			67	67	0	0	0
				7	0	0	0
				8	0	0	0
128		96		704	2	0	0
		2		0	0	2	0
			1	1	0	0	0
				0	0	9	0
			125	125	0	0	0
			33	5	28	0	0
2				2	0	1	0
				0	0	0	11
341	5	115	333	6,261	48	1,011	152

Table H-1 (Continued)

Target and Nontarget Species Captured and Destroyed or Released by the APHIS ADC Program, FY 1988

Ohio (FY 1988)

Species	Leg-hold Trap	Quick-kill Trap	Snare	Shooting	*Target Species* Destroyed	*Target Species* Released	*Nontarget Species* Destroyed	*Nontarget Species* Released
Mammals								
Coyote	6		3		9	0	0	0
Fox, red	7				6	0	1	0
Raccoon				1	1	0	0	0
Woodchuck		6			6	0	0	0
Totals	13	6	3	1	22	0	1	0

Oklahoma (FY 1988)

Species	Fixed Wing[a]	Heli-copter[a]	M-44	Cage Trap	Leg-hold Trap	Snare	Denning
Mammals							
Armadillo				9			
Badger					26	1	
Beaver					98	97	
Boar, Russian						2	
Bobcat					12		
Cat, domestic				43	16		
Coyote	171	1,139	455		956	288	119
Dog, domestic			15	1	21	13	
Fox, gray					4		
Hog, feral							
Marmot species				26	2		
Muskrat					60		
Opossum			17	116	123	2	
Porcupine					1		
Prairie dog species							
Raccoon			2	210	106	14	
Skunk species[b]			72	318	213	1	
Squirrel, Eastern fox				5			
Squirrel, gray				10			
Totals	171	1,139	561	738	1,638	418	119

[a] Hours Flown — Fixed Wing: 113.9, Helicopter: 271.0.
[b] Primarily striped skunk were killed, but includes at least one spotted skunk.

Pennsylvania/New Jersey[a] (FY 1988)

Species	Cage Trap	Snap Trap	Net	DRC1339/ 4-Amino-pyridine	*Target Species* Destroyed	Released	*Nontarget Species* Destroyed	Released
Mammals								
Opossum	1				1	0	0	0
Raccoon	1				1	0	0	0
Rat, Norway	56	54			110	0	0	0
Birds								
Blackbirds/starlings[b]				2,200	2,200	0	0	0
Goose, Canada			6		0	6	0	0
Totals	58	54	6	2,200	2,312	6	0	0

[a] The programs in these two States are under one state director; data are reported together.
[b] Blackbirds and starlings killed were reported together. Species composition of starlings in blackbird roosts is 16 percent (Stickley, A.R., Jr., Personal communication, October 2, 1989). Thus, an estimated 1,848 blackbirds and 352 starlings were killed.

Oklahoma (FY 1988)

Calling and Shooting	Shoot-ing	Hunting Dogs	Other	*Target Species* Destroyed	Released	*Nontarget Species* Destroyed	Released
			1	8	0	0	2
				14	0	11	2
	78		3,107	3,380	0	0	0
	4			6	0	0	0
				3	3	2	4
				2	32	4	21
430	142			3,700	0	0	0
				4	0	19	27
				3	0	0	1
	7			7	0	0	0
	1			23	6	0	0
			155	209	0	6	0
	1			77	27	116	39
				0	0	1	0
	6			6	0	0	0
	1	33	1	265	56	15	31
	13		14	631	0	0	0
				3	2	0	0
				1	9	0	0
430	253	33	3,278	8,342	135	174	127

Table H-1 (Continued)

Target and Nontarget Species Captured and Destroyed or Released by the APHIS ADC Program, FY 1988

Oregon (FY 1988)

Species	Fixed Wing	Heli-copter	M-44	Cage Trap	Leghold Trap	Snare	Denning
Mammals							
Badger					451	34	
Bear, black			3	5	2	79	
Beaver				6	84	67	
Beaver, mountain					13	3	
Bobcat					203	14	
Coyote	1,274	69	389		3,057	844	427
Fox, gray			1		7	5	
Fox, red			30	3	158	63	
Mountain lion					2	5	
Nutria				28	50	15	
Opossum			3	134	591	43	
Porcupine					415	187	
Raccoon				81	377	49	
Skunk species[a]			3	456	344	16	
Other mammals				17	40	1	
Birds							
Raven species							
Totals	1,274	69	429	730	5,794	1,425	427

[a] Category primarily represented by striped skunk, but could contain spotted skunk.

South Dakota (FY 1988)

Species	Fixed Wing	M-44	Cage Trap	Leghold Trap	Snare
Mammals					
Badger				63	7
Beaver			12	357[a]	163
Bobcat				5	
Coyote	1,061[b]	610		350	193
Fox, red	51[c]	116		173	61
Porcupine				10	
Raccoon		2	70	256	24
Skunk species[d]		3	10	112	3
Totals	1,112	731	92	1,326	451

[a] Includes beaver killed by conibear trap. Separate records were maintained during FY 1988.
[b] 305 coyotes killed while using private aircraft under APHIS ADC supervision.
[c] Seven fox killed while using private aircraft under APHIS ADC supervision.
[d] Category primarily represented by striped skunk, but could contain spotted skunk.

Oregon (FY 1988)

Calling and Shooting	Shooting	Hunting Dogs	Other	*Target Species* Destroyed	*Target Species* Released	*Nontarget Species* Destroyed	*Nontarget Species* Released
	28	1		460	0	17	37
	5	37		128	0	1	2
	3			157	0	0	3
				16	0	0	0
	1	3		37	0	12	172
331	328	23	7	6,749	0	0	0
				4	0	0	9
	2			213	0	10	33
		8		12	0	2	1
				86	0	1	6
	3			727	0	46	1
	84			587	0	85	14
	4	31		306	0	36	200
1	9			797	0	32	0
				55	0	2	1
			105	105	0	0	0
332	467	103	112	10,439	0	244	479

South Dakota (FY 1988)

Denning	Calling and Shooting	Shooting	*Target Species* Destroyed	*Target Species* Released	*Nontarget Species* Destroyed	*Nontarget Species* Released
		2	38	0	30	4
		44	576	0	0	0
			0	0	1	4
370	210	112	2,906	0	0	0
583	9	61	1,012	0	42	0
			10	0	0	0
15		16	308	11	64	0
1		8	88	0	49	0
969	219	243	4,938	11	186	8

Table H-1 (Continued)

Target and Nontarget Species Captured and Destroyed or Released by the APHIS ADC Program, FY 1988

Texas (FY 1988)

Species	Fixed Wing	Heli-copter	M-44	Cage Trap	Leghold Trap	Snare	Denning	Calling and Shooting
Mammals								
Armadillo				2	1			
Badger			3		142	63		
Bat species								
Beaver				2	108	49		
Boar, Russian				16	6	154		
Bobcat	5	35	17		671	215		27
Cat, domestic			1	7	44	6		
Coyote	1,548	986	6,706		3,557	3,501	226	655
Deer species					134	122		
Dog, domestic			128		120	109		1
Fox, gray			364	1	1,108	155		8
Fox, kit					29	1		
Fox, red	3	21	210	1	204	112	40	3
Fox, swift			2		8			
Goat, feral					1	14		
Gopher species								
Hog, feral		22	2	96	20	233		
Jackrabbit species					128	64		
Mink								
Mountain lion					37	3		
Mouse, house								
Nutria					29			
Opossum			93	536	262	5		
Peccary (javelina)			3		284	510		
Porcupine			1		303	222		
Prairie dog species								
Rabbit, cottontail				1	45	1		
Raccoon			123	282	1,518	332		
Rat, black								
Ringtail			11		163			
Rodent, commensal								
Skunk, hognose				1	6			
Skunk, spotted			5	4	14	1		
Skunk, striped			140	219	849	29		
Squirrel, Eastern fox				24	3			
Squirrel, ground species					1			
Woodrat species (pack rat)					2			

(Continued)

Texas (FY 1988)

Shoot-ing	Hunting Dogs	Aluminum Phosphide	Zinc	Strych-nine	Other	DRC-1339	*Target Species* Destroyed	*Target Species* Released	*Nontarget Species* Destroyed	*Nontarget Species* Released
1							2	1	1	0
4					4		34	0	153	29
					29		28	1	0	0
102					2,498		2,731	0	28	0
1	5						177	0	5	0
30	4				7		983	2	19	7
							0	7	45	6
354					28		17,561	0	0	0
							0	0	128	128
6							41	4	242	77
9					2		548	36	596	467
							0	0	2	28
18							570	9	32	1
							0	0	5	5
							0	0	2	13
					8		8	0	0	0
35							385	0	16	7
15				29	4		48	3	111	78
					1		0	0	1	0
							39	0	1	0
					2		2	0	0	0
138			7		352		506	0	20	0
6					75		605	42	274	56
							0	0	763	34
9					1		85	1	382	68
15		425					440	0	0	0
4					1		5	0	37	10
6					193		1,396	45	714	299
			146				146	0	0	0
							1	0	68	105
			48				48	0	0	0
							7	0	0	0
					2		26	0	0	0
26					35		1,297	1	0	0
3					18		9	37	2	0
					1		1	0	1	0
							0	0	2	0

(Continued)

H Appendix

Table H-1 (Continued)

Target and Nontarget Species Captured and Destroyed or Released by the APHIS ADC Program, FY 1988

Texas (FY 1988) (Continued)

Species	Fixed Wing	Heli-copter	M-44	Cage Trap	Leghold Trap	Snare	Denning	Calling and Shooting
Birds								
Blackbird group[a]				2,419				
Cormorant, double-crested								
Hawk/falcon species					1			
Owl species					4			
Pigeon (rock dove)				185				
Roadrunner					4			
Shorebird, unidentified					1			
Sparrow species								
Swallow/Martin species								
Turkey, wild					3	2		
Vulture species			8	129	15	1		
Exotic birds					1			
Other Species								
Rattlesnake species					2	2		
Turtle species								
Reptiles, unidentified								
Totals	1,556	1,064	7,817	3,925	9,828	5,906	266	694

[a] Includes blackbirds, cowbirds, and grackles.

Texas (FY 1988)

Shoot-ing	Hunting Dogs	Aluminum Phosphide	Zinc	Strych-nine	Other	DRC-1339	*Target Species* Destroyed	*Target Species* Released	*Nontarget Species* Destroyed	*Nontarget Species* Released
1,957				103	3	369	4,837	14	0	0
13					4		17	0	0	0
							0	0	1	0
					2		0	2	4	0
380				276	10		851	0	0	0
							0	0	3	1
							0	0	1	0
				60			60	0	0	0
					3		0	3	0	0
							0	0	3	2
185							314	0	20	4
							0	0	0	1
							0	0	2	2
					22		0	0	22	0
					6		6	0	0	0
3,317	9	425	201	468	3,311	369	33,814	208	3,706	1,428

Table H-1 (Continued)

Target and Nontarget Species Captured and Destroyed or Released by the APHIS ADC Program, FY 1988

Utah (FY 1988)

Species	Fixed Wing	Heli-copter	M-44	Leghold Trap	Snare	Denning
Mammals						
Badger				61	5	
Bear, black					17	
Beaver					2	
Bobcat				14		
Coyote	1,509	840	582	483	154	746
Deer, species				2	5	
Dog, domestic			3	3	1	
Fox, gray				2		
Fox, kit			7	7		
Fox, red	2	1	70	18	15	38
Fox, swift			7	7		
Jackrabbit species				18		
Marmot species				21	1	
Mountain lion				3	6	
Porcupine				27	3	
Raccoon			1	12		
Skunk, striped			2	13		
Birds						
Eagle, golden				1		
Raven species			1			
Totals	1,511	841	673	692	209	784

Utah (FY 1988)

Calling and Shooting	Shoot-ing	Hunting Dogs	Other	*Target Species* Destroyed	*Target Species* Released	*Nontarget Species* Destroyed	*Nontarget Species* Released
				0	0	63	3
		10		25	0	0	2
	1			2	0	0	1
				8	0	4	2
432	80	26	1	4,853	0	0	0
				0	0	6	1
	3			3	0	5	2
				0	0	2	0
				0	0	13	1
1	4			118	0	30	1
				0	0	13	1
				0	0	17	1
	6			28	0	0	0
	1	18		28	0	0	0
				0	0	29	1
				7	0	5	1
				15	0	0	0
				0	0	0	1
	4			4	0	1	0
433	99	54	1	5,091	0	188	18

Table H-1 (Continued)

Target and Nontarget Species Captured and Destroyed or Released by the APHIS ADC Program, FY 1988

Washington (FY 1988)

Species	Fixed Wing	M-44	Shooting	Leghold Trap	Snare	Denning	Cage Trap
Mammals							
Badger				25	9		
Bobcat				1			
Coyote	4	2	58	318	73	170	
Marmot species			56	155			
Mountain lion				1			
Muskrat				11			
Porcupine				10	12		
Raccoon				8			8
Skunk species[a]				35			10
Other mammals			1	19			
Birds							
Blackbird group[b]			76				
Coot, American							
Gull species[c]			60				
Heron species							3
Magpie, black-billed			4				77
Pigeon (rock dove)			2,921				4,005
Raven species							2
Sparrow, house			61				
Starling							
Other birds							
Totals	4	2	3,237	583	94	170	4,105

[a] Category primarily represented by striped skunk, but could contain spotted skunk.
[b] Includes blackbirds, cowbirds, and grackles.
[c] In addition, 4,187 gull nests were destroyed by ground spraying with superior oil.

Washington (FY 1988)

Calling and Shooting	Hunting Dogs	Decoy Trap	DRC-1339	*Target Species* Destroyed	Released	*Nontarget Species* Destroyed	Released
				22	0	2	10
				0	0	0	1
14	42			681	0	0	0
				207	0	0	4
				0	0	1	0
				1	0	0	10
				22	0	0	0
				12	0	0	4
				45	0	0	0
				1	0	15	4
		9,763		9,839	0	0	0
		103		47	56	0	0
				60	0	0	0
				3	0	0	0
				81	0	0	0
				6,926	0	0	0
				0	2	0	0
		659		720	0	0	0
		99,148	262,912	362,060	0	0	0
		541		0	0	168	373
14	42	110,214	262,912	380,727	58	186	406

Table H-1 (Continued)

Target and Nontarget Species Captured and Destroyed or Released by the APHIS ADC Program, FY 1988

Wisconsin (FY 1988)

Species	Conibear Trap	Snare	Leghold Trap	Shooting	*Target Species* Destroyed	*Target Species* Released	*Nontarget Species* Destroyed	*Nontarget Species* Released[a]
Mammals								
Beaver	275	68	30	35	408	0	0	0
Muskrat	29		15		0	0	42	2
Otter, river	9	3			0	0	10	2
Raccoon	6	9	4		0	0	14	5
Other species								
Turtle species	4	4					11	39

[a] The methods of capture were not specified in the annual report; therefore, the totals reported by method do not include nontarget species released.

Wyoming (FY 1988)

Species	Fixed Wing	Heli-copter	M-44	Leg-hold Trap	Snare	Den-ning	Calling and Shoot-ing	Shoot-ing	*Target Species* Destroyed	*Target Species* Released	*Nontarget Species* Destroyed	*Nontarget Species* Released
Mammals												
Badger				2					2	0	0	0
Bear, black				1					1	0	0	0
Bobcat				6	2				8	0	0	0
Coyote	2,441	749	325	366	140	881	526	298	5,726	0	0	0
Fox, red	112	1	152	341	63	152	8	64	893	0	0	0
Raccoon			1	4					5	0	0	0
Skunk, striped				4					4	0	0	0
Totals	2,553	750	478	724	205	1,033	534	362	6,639	0	0	0

Appendix I

Target and Nontarget Species Captured and Released or Destroyed by the APHIS ADC Program, FY 1989-91

Appendix I

Target and Nontarget Species Captured and Released or Destroyed by the APHIS ADC Program, FY 1989-91

The data in this Appendix are provided in response to comments and provide context for the sample year (FY 1988) data used in this document.

Table I-1

Target and Nontarget Species Captured and Released or Destroyed by the APHIS ADC Program, FY 1989

Species	Released	Destroyed	Total
Target			
Alligator	0	1	1
Armadillo	0	13	13
Badger	8	878	886
Bat	19	7	26
Bear, black	15	225	240
Bear, grizzly	1	0	1
Beaver	19	11,320	11,339
Beaver, mountain	0	12	12
Blackbird	1	1,543,762	1,543,763
Bobcat	98	1,163	1,261
Cat, feral	61	238	299
Chipmunk	0	9	9
Coati	0	1	1
Coot	266	166	432
Cormorant	0	307	307
Cowbird	0	208	208
Coyote	5	86,485	86,490
Crow	0	142	142

(Continued)

Table I-1 (Continued)

Target and Nontarget Species Captured and Released or Destroyed by the APHIS ADC Program, FY 1989

Species	Released	Destroyed	Total
Deer	0	99	99
Dog	72	160	232
Duck	130	34	164
Eagle, golden	5	0	5
Egret	0	77	77
Egret, cattle	0	5,903	5,903
Fox	0	961	961
Fox, gray	152	717	869
Fox, red	13	4,095	4,108
Goat, feral	0	12	12
Goose	3,262	0	3,262
Goose, Canada	454	12	466
Gopher	0	2,321	2,321
Grackle	0	5,253	5,253
Gull	0	188	188
Hawk	17	91	108
Heron	1	77	78
Heron/egret	3,487	99	3,586
Hog, feral	2	722	724
Hog, Russian	0	330	330
Kite	22	0	22
Lion, mountain	2	232	234
Magpie	0	140	140
Mammal, other	1	0	1
Marmot	0	129	129
Mouse	0	5	5
Mink	0	51	51
Muskrat	1	283	284
Nutria	0	487	487
Opossum	230	3,455	3,685
Otter	0	15	15
Owl	13	11	24
Parakeet, monk	0	1	1
Pelican	0	1	1
Pigeon	3	19,805	19,808
Porcupine	3	1,084	1,087
Prairie dog	0	502	502
Rabbit	779	72	
Raccoon	1,431	4,766	6,197
Rat	0	177	177
Rattlesnake	0	59	59
Raven	0	950	950
Reptile	7	5	12
Ringtail	1	0	1
Skunk	0	386	386
Skunk, hog-nosed	0	4	4

(Continued)

Table I-1 (Continued)

Target and Nontarget Species Captured and Released or Destroyed by the APHIS ADC Program, FY 1989

Species	Released	Destroyed	Total
Skunk, spotted	0	31	31
Skunk, striped	4	8,878	8,882
Sparrow	101	723	824
Squirrel	91	29	120
Squirrel, ground	44	316	360
Starling	0	475,686	475,686
Swan	0	8	8
Turtle	0	45	45
Vulture	0	54	54
Weasel	5	1	6
Wolf	16	80	96
Woodchuck	0	7	7
Woodpecker	0	1	1
Total:	10,151	2,183,484	2,193,635
Nontarget			
Alligator	3	5	8
Armadillo	4	0	4
Badger	422	160	582
Bear, black	11	15	26
Beaver	0	2	2
Birds (other)	0	2	2
Blackbird	0	2	2
Bobcat	57	236	293
Canine	2	0	2
Cat, feral	27	103	130
Coati	0	1	1
Coot	0	150	150
Cormorant	1	0	1
Coyote	17	3	20
Crow	5	0	5
Deer	134	80	214
Dog	372	279	651
Duck	2	2	4
Finch	126	916	1,042
Fisher	0	1	1
Fox	1	1	2
Fox, gray	954	472	1,426
Fox, kit	158	29	187
Fox, red	262	109	371
Fox, swift	10	14	24
Goat, feral	4	0	4
Goose	1	0	1
Hawk	0	1	1
Heron	1	0	1
Hog, feral	69	42	111

(Continued)

Table I-1 (Continued)

Target and Nontarget Species Captured and Released or Destroyed by the APHIS ADC Program, FY 1989

Species	Released	Destroyed	Total
Hog, Russian	64	7	71
Javelina	659	42	701
Lion, mountain	5	0	5
Marmot	2	0	2
Marten	0	1	1
Mink	2	1	3
Muskrat	246	2	248
Nutria	18	0	18
Opossum	294	61	355
Otter	93	7	100
Porcupine	720	58	778
Pronghorn	0	4	4
Rabbit	194	50	244
Raccoon	924	590	1,514
Rat	1	0	1
Rattlesnake	1	1	2
Raven	1	1	2
Reptile	0	1	1
Ringtail	38	89	127
Roadrunner	5	0	5
Robin	18	90	108
Shorebird	1	0	1
Skunk	14	1	15
Skunk, hog-nosed	5	0	5
Skunk, hooded	6	0	6
Skunk, spotted	6	0	6
Skunk, striped	133	0	133
Sparrow	1	0	1
Squirrel	2	4	6
Squirrel, ground	4	0	4
Turkey	6	4	10
Turtle	87	184	271
Vulture	15	23	38
Wolf	0	1	1
Woodchuck	0	2	2
Woodpecker	0	2	2
Total:	6,208	3,851	10,059

Table I-2

Target and Nontarget Species Captured and Released or Destroyed by the APHIS ADC Program, FY 1990

Species	Released	Destroyed	Total
Target			
Albatross, Laysan	409	0	409
Alligator, American	0	2	2
Armadillo, nine-banded	0	4	4
Badger	15	862	877
Bats (multiple species)	2	0	2
Bear, black	402	238	640
Bear, grizzly	2	0	2
Beaver	54	12,815	12,869
Beaver, mountain	0	5	5
Bird, song (other)	0	4	4
Blackbird, red-winged	0	9,835	9,835
Blackbird, yellow-headed	0	609	609
Blackbirds (multiple species)	0	202,569	202,569
Boar, Russian	0	379	379
Bobcat	63	1,028	1,091
Cardinal, northern	0	1	1
Cat, feral	50	291	341
Chipmunk, eastern	0	9	9
Coot, American	0	104	104
Cormorant, double-crested	0	9	9
Cottontail, eastern	0	12	12
Cottontails (multiple species)	0	3	3
Coyote	1	91,223	91,224
Crane, sandhill	0	4	4
Crow, American	0	814	814
Deer, axis	0	262	262
Deer, white-tailed	0	94	94
Dog, feral	31	204	235
Dove, mourning	0	4	4
Dove, spotted	0	2,237	2,237
Dove, zebra	0	13,540	13,540
Duck, black	0	2	2
Ducks (multiple species)	0	9	9
Egret, cattle	0	6,322	6,322
Falcons/hawks (multiple species)	1	2	3
Ferret, European	0	1	1
Finch, house	0	343	343
Flicker, northern	0	7	7
Fox, Arctic	0	23	23
Fox, gray	89	858	947
Fox, kit	0	1	1
Fox, red	4	6,190	6,194
Francolin, black	0	58	58
Francolin, grey	0	131	131
Goat, feral	0	107	107
Goose, Canada	2,434	2	2,436

(Continued)

Table I-2 (Continued)

Target and Nontarget Species Captured and Released or Destroyed by the APHIS ADC Program, FY 1990

Species	Released	Destroyed	Total
Goose (domestic)	12	0	12
Gophers, pocket (multiple species)	0	32	32
Grackles (multiple species)	0	2,444	2,444
Gull, California	0	262	262
Gull, great black-backed	0	91	91
Gull, herring	0	881	881
Gull, laughing	0	136	136
Gull, ring-billed	0	8,339	8,339
Gulls (multiple species)	0	2	2
Harrier, northern	0	2	2
Hawk, Cooper's	1	0	1
Heron, black-crowned night	17	25	42
Heron, great blue	0	39	39
Heron, little blue	0	1	1
Herons (multiple species)	0	1	1
Hog, feral	2	936	938
Javelina	4	3	7
Junglefowl, red	0	5	5
Kestrel, American	11	12	23
Lion, mountain	1	250	251
Magpie, black-billed	0	112	112
Mallard	84	6	90
Mallard (domestic)	110	0	110
Mannikin, chestnut	0	8,795	8,795
Mannikin, nutmeg	0	869	869
Marmot, yellow-bellied	3	2,401	2,404
Meadowlark, western	1	98	99
Mink	1	28	29
Moles (multiple species)	0	1	1
Mongoose, Indian	0	392	392
Mouse, house	0	2	2
Mouse, jumping	0	3	3
Mouse, white-footed	0	110	110
Muskrat	0	356	356
Myna, common	0	2,576	2,576
Nutria	0	593	593
Opossum, Virginia	243	3,463	3,706
Otter, river	0	30	30
Owl, great horned	1	3	4
Owls (multiple species)	13	8	21
Pheasant, ring-necked	0	145	145
Pig, feral	0	2	2
Pigeon (rock dove)	0	23,544	23,544
Plover, lesser golden	0	319	319
Porcupine	1	1,083	1,084
Prairie dog, black-tailed	0	54	54
Prairie dogs (multiple species)	0	494	494

(Continued)

Table I-2 (Continued)

Target and Nontarget Species Captured and Released or Destroyed by the APHIS ADC Program, FY 1990

Species	Released	Destroyed	Total
Rabbit, black-tailed jack	1	97	98
Rabbit, brush	4	0	4
Raccoon	876	5,941	6,817
Rat, black	0	27	27
Rat, kangaroo	0	1	1
Rattlesnake, western	0	38	38
Rattlesnakes (multiple species)	0	4	4
Raven, common	0	862	862
Ravens (multiple species)	0	31	31
Reptiles (multiple species)	8	0	8
Ringtail	1	1	2
Scoters (multiple species)	0	7	7
Shrew, masked	0	1	1
Shrew, short-tailed	0	38	38
Shrike, logger-headed	0	35	35
Skunk, hog-nosed	1	16	17
Skunk, spotted	0	59	59
Skunk, striped	4	8,082	8,086
Sparrow, house	0	620	620
Sparrow, Java	0	67	67
Sparrows (multiple species)	0	1	1
Squirrel, Douglas'	1	0	1
Squirrel, flying	0	3	3
Squirrel, fox	101	19	120
Squirrel, gray	30	23	53
Squirrel, red	0	26	26
Squirrels, ground (multiple species)	0	761	761
Starling, European	0	627,675	627,675
Starling, glossy	0	20,000	20,000
Tern, Caspian	0	1	1
Turtle, snapping	0	4	4
Turtle, western pond	0	1	1
Turtles (multiple species)	0	60	60
Vole, pine	0	16	16
Vulture, black	0	3	3
Vulture, turkey	0	4	4
Vultures (multiple species)	0	9	9
Weasel, long-tailed	0	2	2
Weasels (multiple species)	0	1	1
Wolf, gray	0	94	94
Woodchuck	1	84	85
Woodpeckers (multiple species)	0	8	8
Woodrat, bushy-tailed	1	0	1
Woodrats (multiple species)	0	1	1
Total:	5,091	1,074,888	1,079,979

(Continued)

Table I-2 (Continued)

Target and Nontarget Species Captured and Released or Destroyed by the APHIS ADC Program, FY 1990

Species	Released	Destroyed	Total
Nontarget			
Alligator, American	6	3	9
Armadillo, nine-banded	0	3	3
Badger	167	389	556
Bear, black	11	9	20
Beaver	1	3	4
Boar, Russian	3	21	24
Bobcat	189	62	251
Cat, feral	63	31	94
Catbird, gray	1	0	1
Cattle (domestic)	1	0	1
Chipmunks (multiple species)	0	3	3
Cottontail, eastern	0	2	2
Cottontails (multiple species)	65	27	92
Coyote	0	3	3
Crow, American	12	9	21
Deer (multiple species)	3	0	3
Deer, mule	2	20	22
Deer, white-tailed	72	147	219
Dog, feral	272	415	687
Duck, wood	0	1	1
Ducks (multiple species)	2	13	15
Eagle, bald	0	1	1
Fisher	4	1	5
Fox, gray	341	1,048	1,389
Fox, kit	52	168	220
Fox, red	122	359	481
Fox, swift	6	13	19
Gar	0	1	1
Goat, feral	1	0	1
Gophers, pocket (multiple species)	0	1	1
Grackles (multiple species)	0	2	2
Gulls (multiple species)	2	1	3
Heron, great blue	0	14	14
Hog, feral	26	60	86
Javelina	38	648	686
Jay, scrub	1	0	1
Killdeer	0	1	1
Lion, mountain	1	5	6
Lynx	1	1	2
Mink	1	6	7
Muskrat	1	198	199
Nuthatch, white-breasted	0	2	2
Nutria	4	21	25
Opossum, Virginia	58	237	295
Otter, river	12	114	126

(Continued)

Table I-2 (Continued)

Target and Nontarget Species Captured and Released or Destroyed by the APHIS ADC Program, FY 1990

Species	Released	Destroyed	Total
Parakeet, monk	2	1	3
Peccary, collared	3	5	8
Pig, feral	0	4	4
Porcupine	31	631	662
Pronghorn	4	4	8
Rabbit, black-tailed jack	17	170	187
Rabbits, jack (multiple species)	0	17	17
Raccoon	537	1,074	1,611
Rat, Norway	0	1	1
Rattlesnakes (multiple species)	1	1	2
Raven, common	15	5	20
Reptiles (multiple species)	2	0	2
Ringtail	20	39	59
Roadrunner, greater	0	1	1
Skunk, Gulf Coast hog-nosed	0	2	2
Skunk, spotted	0	4	4
Skunk, striped	10	186	196
Squirrel, fox	0	4	4
Squirrel, gray	19	0	19
Squirrels, ground (multiple species)	0	5	5
Starling, European	0	1	1
Turkey, wild	8	6	14
Turtle, musk	0	5	5
Turtle, snapping	141	166	307
Turtles (multiple species)	89	111	200
Vulture, turkey	0	2	2
Vultures (multiple species)	10	20	30
Weasel, short-tailed	1	0	1
Weasels (multiple species)	0	2	2
Wolf, gray	0	1	1
Woodchuck	2	2	4
Woodpecker, pileated	0	1	1
Total:	2,453	6,535	8,988

Table I-3

Target and Nontarget Species Captured and Released or Destroyed by the APHIS ADC Program, FY 1991

Species	Released	Destroyed	Total
Target			
Albatross, Laysan	113	0	113
Alligator, American	2	3	5
Armadillo, nine-banded	1	9	10
Badger	8	785	793
Bats (multiple species)	5	1	6
Bears, black	319	214	533
Bear, grizzly	1	0	1
Beaver	76	15,774	15,850
Beaver, mountain	0	42	42
Birds, exotic	0	37	37
Birds, wading	0	10	10
Blackbirds (multiple species)	0	1,522,397	1,522,397
Blackbird, red-winged	0	8,571	8,571
Bobcat	73	961	1,034
Cardinal, northern	0	5	5
Cardinal, red-crested	0	1	1
Cat, feral/free-ranging house	115	252	367
Coot	0	164	164
Cormorant, double-crested	0	30	30
Cowbird, brown-headed	100	331	431
Coyote	2	95,892	95,894
Crane, sandhill	0	0	0
Crows (multiple species)	1	3,282	3,283
Cuckoo, New Zealand	0	0	0
Deer, white-tailed	0	229	229
Deer (other)	0	128	128
Dog, feral/free-ranging	90	159	249
Doves (multiple species)	0	17,941	17,941
Ducks, dabbling (multiple species)	764	0	764
Duck, Hawaiian	17	0	17
Egret, cattle	0	4,930	4,930
Egret, great	0	10	10
Finch, house	0	438	438
Fox, gray	124	1,127	1,251
Fox, red	14	7,550	7,564
Francolins (multiple species)	0	1,251	1,251
Goose (domestic)	12	0	12
Goose, Canada	4,286	13	4,299
Goat, feral	0	4	4
Gophers, pocket (multiple species)	0	29	29
Grackles (multiple species)	0	5,365	5,365
Gull, great black-backed	0	352	352
Gull, herring	0	736	736
Gull, laughing	4	14,972	14,976
Gull, ring-billed	0	6,681	6,681

Continued

Table I-3 (Continued)

Target and Nontarget Species Captured and Released or Destroyed by the APHIS ADC Program, FY 1991

Species	Released	Destroyed	Total
Gulls (other)	0	116	116
Harrier (marsh hawk)	0	10	10
Hawks (other)	1	0	1
Heron, great blue	0	25	25
Heron, little blue	0	6	6
Herons, night (multiple species)	8	1	9
Hog, feral	0	2,017	2,017
Junglefowl, red	0	12	12
Kestrel, American	3	16	19
Lion, mountain	1	205	206
Magpies (multiple species)	0	110	110
Mannikins (multiple species)	0	2,334	2,334
Marmots (multiple species)	2	1,408	1,410
Meadowlarks (multiple species)	6	33	39
Mice, field (other)	0	5	5
Mouse, house	0	14	14
Mink	0	17	17
Moles (multiple species)	0	4	4
Mongoose, Indian	0	813	813
Muskrat	3	287	290
Mynas (multiple species)	0	4,125	4,125
Nutria	0	613	613
Opossum, Virginia	130	3,397	3,527
Otter, river	6	18	24
Owl, common barn	0	1	1
Owl, great horned	11	3	14
Passerines (other)	1	13	14
Peccary, collared (javelina)	0	12	12
Pelican, American white	0	2	2
Pheasant, ring-necked	0	48	48
Pigeon, feral (rock dove)	1	38,462	38,463
Plover, Pacific golden	0	142	142
Porcupine	4	825	829
Prairie dog, black-tailed	0	354	354
Prairie dogs (other)	0	52	52
Rabbit, cottontail	0	13	13
Rabbit, feral	0	11	11
Rabbit, jack (multiple species)	1	111	112
Raccoon	625	6,498	7,123
Rat, black (roof)	0	83	83
Rat, Norway	0	45	45
Rats, woodrats (multiple species)	0	16	16
Rat, Polynesian	0	910	910
Ravens (multiple species)	2	1,041	1,043
Reptile, exotic	2	7	9
Shrews (multiple species)	0	4	4

Continued

Table I-3 (Continued)

Target and Nontarget Species Captured and Released or Destroyed by the APHIS ADC Program, FY 1991

Species	Released	Destroyed	Total
Shrikes (multiple species)	2	20	22
Skunk, hog-nosed	3	4	7
Skunk, spotted	1	44	45
Skunk, striped	8	8,949	8,957
Snakes, poisonous (multiple species)	0	1	1
Sparrow, English	0	1,416	1,416
Sparrow, Java	0	133	133
Squirrels, flying (multiple species)	0	1	1
Squirrel, fox	32	9	41
Squirrel, gray	4	8	12
Squirrels, ground (multiple species)	32	285	317
Squirrel, red	1	13	14
Squirrels (other)	10	140	150
Starlin, European	0	758,678	758,678
Starling, glossy	0	10,000	10,000
Swifts (multiple species)	0	1	1
Turtles (multiple species)	0	45	45
Voles (multiple species)	0	2,239	2,239
Vultures (mixed)	0	20	20
Vulture, black	0	10	10
Vulture, turkey	0	1	1
Weasels (multiple species)	0	1	1
Wolf, gray	13	70	83
Total:	7,040	2,557,544	2,564,584
Nontarget			
Alligator, American	6	5	11
Armadillo, nine-banded	0	7	7
Badger	154	344	498
Bats (multiple species)	0	12	12
Bears, black	7	10	17
Beaver	0	3	3
Bobcat	148	76	224
Cardinal, northern	1	2	3
Cardinal, red-crested	1	0	1
Cat, feral/free-ranging house	63	35	98
Cowbird, brown-headed	12	0	12
Coyote	0	18	18
Crane, sandhill	1	0	1
Crows (multiple species)	0	10	10
Cuckoo, New Zealand	0	1	1
Deer, mule	8	21	29
Deer, white-tailed	43	124	167
Dog, feral/free-ranging	204	449	653
Doves (multiple species)	1	0	1

(Continued)

Table I-3 (Continued)

Target and Nontarget Species Captured and Released or Destroyed by the APHIS ADC Program, FY 1991

Species	Released	Destroyed	Total
Ducks, dabbling (multiple species)	0	22	22
Duck, Hawaiian	6	6	12
Finch, house	22	60	82
Fisher	0	2	2
Flickers (multiple species)	12	0	12
Fox, gray	240	897	1137
Fox, kit	15	155	170
Fox, red	61	446	507
Fox, swift	0	46	46
Frogs/toads (multiple species)	0	2	2
Goat, feral	0	2	2
Gophers, pocket (multiple species)	0	1	1
Gulls (other)	1	1	2
Hare, snowshoe	0	4	4
Hawks (other)	7	0	7
Heron, great blue	0	17	17
Hog, feral	22	148	170
Jays (multiple species)	15	1	16
Lion, mountain	0	5	5
Marmots (multiple species)	0	1	1
Meadowlarks (multiple species)	2	0	2
Mice, field (other)	0	2	2
Mouse, house	0	9	9
Mink	1	7	8
Moose	0	1	1
Muskrat	1	397	398
Nutria	1	63	64
Opossum, Virginia	59	250	309
Osprey	1	0	1
Otter, river	32	253	285
Owl, great horned	1	0	1
Passerines (other)	55	2	57
Peccary, collared (javelina)	46	703	749
Pigeon, feral (rock dove)	0	9	9
Plover, Pacific golden	0	2	2
Porcupine	42	627	669
Pronghorn (antelope)	2	6	8
Rabbit, cottontail	0	21	21
Rabbit, jack (multiple species)	11	303	314
Raccoon	476	1,280	1,756
Rat, black (roof)	0	1	1
Ravens (multiple species)	0	13	13
Ringtail	34	43	77
Skunk, hooded	0	3	3
Skunk, striped	2	182	184
Snakes, poisonous (multiple species)	0	52	52

(Continued)

Table I-3 (Continued)

Target and Nontarget Species Captured and Released or Destroyed by the APHIS ADC Program, FY 1991

Species	Released	Destroyed	Total
Sparrow, English	14	8	22
Squirrel, fox	0	1	1
Squirrels, ground (multiple species)	0	107	107
Squirrel, red	1	0	1
Terns (multiple species)	0	2	2
Turkeys, wild (multiple species)	0	8	8
Turtles (multiple species)	438	359	797
Vultures (mixed)	2	5	7
Vulture, Turkey	5	6	11
Weasels (multiple species)	0	8	8
Total:	2,276	7,666	9,942

Appendix J

Methods of Control

Appendix J

Methods of Control

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A. Description of Methods

The most effective approach to resolving wildlife damage problems is to integrate the use of several methods, either simultaneously or sequentially. Integrated Pest Management (IPM) is the integration and application of practical methods of prevention and control to reduce damage by wildlife while minimizing harmful effects of control measures on humans, other species, and the environment. IPM may incorporate Resource Management, Physical Exclusion, Wildlife Management, or any combination of these, depending on the characteristics of specific damage problems.

In selecting control techniques for specific damage situations, consideration is given to the responsible species and the magnitude, geographic extent, duration and frequency, and likelihood of wildlife damage. Consideration also must be given to the status of target and potential nontarget species, local environmental conditions and impacts, social and legal aspects, and relative costs of control options. The cost of control may sometimes be a secondary concern because of the overriding environmental, legal, and animal welfare considerations. These factors are evaluated in formulating control strategies that incorporate the application of one or more techniques.

A variety of methods are used to accomplish objectives of the current Animal and Plant Health Inspection Service (APHIS) Animal Damage Control (ADC) program. Control strategies are based on applied IPM principles. APHIS ADC employs three general strategies for control of wildlife damage: Resource Management, Physical Exclusion, and Wildlife Management. Each of these approaches is a general strategy or recommendation for addressing wildlife damage situations. Within each approach there are available a number of specific methods or tactics. Selection of the appropriate approach and method is the result of the APHIS ADC decisionmaking process outlined in Chapter 2. Mechanical methods generally are used and recommended in preference to chemical pesticides. No pesticide is used or recommended if it is likely to adversely affect fish, wildlife, food safety, or other components of the natural environment.

Various Federal, State, and local statutes and regulations as well as APHIS ADC Directives govern APHIS ADC use of control tools and substances. The following basic wildlife damage control methods and materials are used or recommended in the direct control and technical assistance efforts of the APHIS ADC program:

- Resource Management
  - Animal Husbandry
  - Crop Selection and Planting Schedules
  - Habitat Management
  - Modification of Human Behavior
- Physical Exclusion
  - Fencing
  - Sheathing (hardware cloth, solid metal, chain link)
  - Tree Protectors
  - Entrance Barricades
  - Netting, Porcupine Wire (Nixalite), Wire Grids, and Other Methods
- Wildlife Management
  - Habitat Management
  - Lure Crops/Alternate Foods

- Frightening Devices
- Chemical Repellents
- Kill or Relocation Methods

The methods listed above all have limitations which are defined by the circumstances associated with individual wildlife damage problems. When APHIS ADC specialists receive a request for assistance, they consider a wide range of limitations as they apply the decisionmaking process described in Chapter 2 to determine what method(s) to use to resolve a wildlife damage problem. Examples of limitations which must be considered and criteria to evaluate various methods are presented in Appendix N and in the following discussions.

B. Resource Management

Resource management includes a variety of practices that may be used by agriculture producers to reduce their exposure to potential wildlife depredation losses. Implementation of these practices is appropriate when the potential for depredation can be reduced without significantly increasing the cost of production or diminishing the resource owner's ability to achieve land management and production goals. Changes in resource management are recommended through the technical assistance extended to producers when the change appears to present a continuing means of averting losses.

1. Animal Husbandry

This general category includes modifications in the level of care and attention given to livestock, shifts in the timing of breeding and births, selection of less vulnerable livestock species to be produced, and the introduction of human custodians or guarding animals to protect livestock.

The level of care or attention given to livestock may range from daily to seasonal. Generally, as the frequency and intensity of livestock handling increase, so does the degree of protection. In operations where livestock are left unattended for extended periods, the risk of depredation is greatest. The risk of depredation can be reduced when operations permit nightly gathering so livestock are unavailable during the hours when predators are most active. Additionally, the risk of depredation is usually greatest with immature livestock. This risk diminishes as age and size increase and can be minimized by holding expectant females in pens or sheds to protect births and by holding newborn livestock in pens for the first 2 weeks. Shifts in breeding schedules can also reduce the risk of depredation by altering the timing of births to coincide with the greatest availability of natural prey to predators or to avoid seasonal concentrations of migrating predators such as golden eagles.

The use of human custodians and guarding animals can also provide significant protection in some instances. The presence of herders to accompany bands of sheep on open range may help ward off predators. Guard dogs have also proven successful in many sheep and goat operations.

Altering animal husbandry to reduce wildlife damage has many limitations. Nightly gathering may not be possible where livestock are in many fenced pastures and where grazing conditions require livestock to scatter. Hiring extra herders, building secure holding pens, and adjusting the timing of births is usually expensive. The timing of births may be related to weather or seasonal marketing of young livestock. The expense associated with a change in husbandry practice may exceed the savings.

The supply of proven guarding dogs is generally quite limited, requiring that most people purchase and rear a pup. Therefore, there is usually a 4-to-8 month period of time necessary to raise a guarding dog before it becomes an effective deterrent to predators. Since 25 to 30 percent of dogs are not successful, there is a reasonable chance that the first dog raised as a protector will not be useful. The effectiveness of guarding dogs may not be sufficient in areas where there is a high density of predators, where livestock widely scatter in order to forage, or where dog-to-livestock ratios are less than recommended. Guarding dogs often harass and kill nontarget wildlife.

2. Crop Selection and Planting Schedules

The choice of crops and the time of planting have a direct bearing on the potential for depredation losses. Some crops are less prone to depredation than others. Crops planted for early or late harvest may have a high potential for wildlife depredation due to the lack of alternate food sources. The composition of native wildlife and their feeding preferences should be considered prior to final selection of crops for production. If migratory wildlife species are involved, it may be possible to regulate the time of planting to reduce or eliminate the availability of vulnerable crops. If altered planting schedules are not feasible, selection of damage-resistant varieties may be possible.

Other resource management approaches include removal of slash, and planting large seedlings immediately after logging to reduce hare and rabbit damage potential; planting or encouraging plant species preferred by deer to improve habitat and reduce the likelihood of browsing damage to commercially grown trees; decreasing cover and foods adjacent to sugar cane to suppress the carrying capacity for rats and other rodents; use of tree species or varieties that are generally resistant to damage by animals; and use of bird-damage resistant hybrids of corn and grain sorghum. In many situations suitable alternative crops might not be available in particular areas or climate zones.

3. Habitat Management

a. Architectural Design

Change in the architectural design of a building or a public space can often help to avoid potential wildlife damage. For example, selecting species of trees and shrubs that are not attractive to wildlife can reduce the likelihood of potential wildlife damage to parks, public spaces, or residential areas. Similarly, incorporating devices into architectural design that exclude wildlife can significantly reduce potential problems. Grids or screens that prevent birds from entering are an example.

Architectural changes are often more feasible if considered during the design stage, rather than after a facility is built. A consideration of wildlife conflicts is frequently overlooked in the construction of new buildings and facilities. Modifying structures or public spaces to remove the potential for wildlife conflicts is often impractical because of economics or the presence of other nearby habitat features that attract wildlife.

b. Modification of Human Behavior

(1) Discourage Wildlife Feeding and Handling

APHIS ADC may recommend alteration of human behavior to resolve potential conflicts between humans and wildlife. For example, APHIS ADC may recommend the elimination of feeding of wildlife that occurs in parks, forest, or residential areas. Many wildlife species adapt well to human settlements and activities, but their proximity to humans may

result in damage to structures or threats to public health and safety. Eliminating wildlife feeding and handling can reduce potential problems, but many people who are not directly affected by problems caused by wildlife enjoy wild animals and engage in activities that encourage their presence. It is difficult to consistently enforce no-feeding regulations and to effectively educate all people concerning the potential liabilities of feeding wildlife.

(2) Alter Aircraft Flight Patterns

With respect to airport safety, not all potential danger to human life and aircraft equipment can be dealt with by relocating bird or other wildlife populations. In such cases, APHIS ADC may recommend that aircraft flight patterns be altered to reduce potential problems. However, altering operations at airports to decrease the potential for wildlife hazards is not feasible unless an emergency condition exists. Otherwise, the expense of interrupted flights and the limitations of existing facilities make this practice prohibitive.

C. Physical Exclusion

Physical exclusion methods restrict the access of wildlife to resources. These methods, (including fences, sheathing, netting, porcupine wire, and wire grids) provide a means of appropriate and effective prevention of wildlife damage in many situations. Physical exclusion methods used or recommended by the APHIS ADC program are described in the following section.

1. Fencing

Fences are widely used to prevent damage to farm crops and forest plantations caused by rabbits, deer, and elk. Predator exclusion fences constructed of woven wire or multiple strands of electrified wire are also effective in some areas, but fencing does have limitations. Even an electrified fence is not predator proof and the expense exceeds the benefit in most cases. If large areas are fenced, the predators have to be removed from the enclosed area to make it useful. Some fences inadvertently trap, catch or affect the movement of nontarget wildlife. It is not uncommon for coyotes to use fences to trap deer or antelope. Lastly, fencing is not practical or legal in some areas (e.g., restricting access to public land).

2. Sheathing

Sheathing consists of using hardware cloth, solid metal flashing, or other materials to protect trees from predators or to block entrances to gardens, fish ponds, dwellings, or other areas. Tree protectors are most often used as protection from bears, beavers, or porcupines. Entrance barricades of various kinds are used to exclude bobcats, coyotes, foxes, opossums, raccoons, skunks, or starlings from dwellings, storage areas, gardens, or other areas. Metal flashing may be used to prevent entry of small rodents to buildings. Sheathing may be impractical where there are numerous plants to protect.

3. Netting, Porcupine Wire, Wire Grids, and Other Methods

Netting consists of placing plastic or wire nets around livestock pens, fish ponds, or agricultural areas. Currently, "Vexar" plastic mesh seedling protectors are widely used in reforestation to protect newly planted seedling trees against hares, rabbits, deer, elk, and pocket gophers . Wire and plastic netting are also used to exclude a variety of birds and

mammals from many crops, roadways, nurseries, poultry operations, and other areas requiring exclusion of animals. Two types of physical barriers frequently used to protect fish from foraging birds are (1) complete enclosure of ponds and raceways with screen or net and (2) partial exclusion using overhead wires, lines, net, or screen. Complete enclosures are costly but effectively exclude all problem birds. Partial enclosures, such as overhead lines, cost less but may not exclude all bird species. Selection of a barrier system depends on the bird species and expected duration of damage, size of facility, compatibility of the barrier with other operations (e.g., feeding, cleaning, harvesting, etc.), possible damage from severe weather, and effect on site aesthetics. Complete enclosure of ponds and raceways to exclude all fish-eating birds requires 1.5- to 2-inch mesh netting secured to frames or supported by overhead wires. Gates and other openings must also be covered. Some hatchery operators use mesh panels placed directly on raceways to effectively exclude birds. Small mesh netting or wire with less than 1-inch openings, secured to wood or pipe frames, prevents feeding through the panels. Because the panels may interfere with feeding, cleaning, or harvesting operations, they are most appropriate for seasonal or temporary protection.

Ponds or raceways can be protected with overhead wires or braided or monofilament lines suspended horizontally in one direction or in a crossing pattern. Spacing between wires or lines should be based on the species and habits of the birds causing damage.

Perimeter fencing or wire around ponds and raceways provides some protection from wading birds and is most effective for herons. For ponds, fencing at least 3 feet high should be erected in water 2 to 3 feet deep. Small mesh can be used to prevent fish from entering the shallow water. If fences are built in shallow water, birds can easily feed on the pond side of the fence. Raceway fences should be high enough to prevent feeding from the wall. Occasionally, blackbirds will cling to fencing or screening near the water and feed on small fish. A slippery surface created by draping plastic over the fence or screen can be used to eliminate this problem. Electric fences or wires have also been used with limited success. Some areas in need of protection are too large to be protected with netting or overhead wires. This type of exclusion can make routine work around ponds and hatcheries difficult or impossible.

Strips of sharp wire or metal spikes are placed on building ledges to exclude pigeons, sparrows, and other birds. However, many buildings and other structures have exposed surfaces too numerous or large to use wire or metal spikes to exclude birds.

APHIS ADC recommends the use of closed storage containers for edible materials (such as seeds) to prevent access by wildlife.

D. Wildlife Management

Controlling wildlife damage through wildlife management is achieved through the use of a myriad of techniques. The objective of this approach is to alter the behavior of the target animal to eliminate or reduce the potential for loss or damage to property.

1. Habitat Management

Just as habitat management is an integral part of other wildlife management programs, it also plays an important role in wildlife damage control. The type, quality, and quantity of habitat are directly related to the wildlife that are produced. Therefore, habitat can be managed to not produce or attract certain wildlife species. Most habitat management in the APHIS ADC program revolves around airports and bird aircraft strike problems, blackbird and European starling winter roosts, and ground vegetation management to control field rodent populations in orchards and crops.

Habitat management around airports is aimed at eliminating bird nesting, roosting, loafing, or feeding sites. Generally, many bird problems on airport grounds can be minimized through management of vegetation (grass, shrubs, brush, and trees) and water from runway areas.

Habitat management also is often necessary to control damage caused by blackbirds and starlings that form large roosts during late fall and winter. Bird activity can be terminated at a roost site by removing all the trees or selectively thinning the stand. Roosts often will re-form at traditional sites, and substantial habitat alteration is the only way to permanently stop such activity.

Dense rodent populations pose a threat to various agricultural operations such as orchards. Maintaining grass cover at minimum heights is necessary in controlling rodent populations in orchards. Eliminating grass in reforestation areas also aids in reducing vole damage to trees.

Certain areas experience damage as a result of beaver dam construction on streams and rivers. Damage to roadways, railways, earthen dams, buildings, and crops results primarily from flooding, but crop and timber losses can also occur from beaver foraging activities. When used in conjunction with the removal of beaver, selective use of explosives to remove watercourse obstructions is a habitat modification method.

Several measures are available to alleviate pocket gopher damage to forest plantations. Leaving strips of uncut timber between logged areas and gopher-infested areas is recommended to reduce the potential of severe gopher damage problems in clear-cutting operations. Selective cutting and replanting, instead of clear-cutting, are recommended to reduce the potential for gopher damage in some areas. Common forest management practices such as weed and grass control can also reduce gopher populations and damage potential.

Limitations of habitat management as a method of controlling wildlife damage are determined by the characteristics of the species involved, the nature of the damage, economic feasibility, and other factors. Also, legal constraints may exist which preclude altering particular habitats.

2. Lure Crops/Alternate Foods

When depredation cannot be avoided by careful crop selection or modified planting schedules, lure crops can sometimes be used to mitigate the loss potential. Lure crops are planted or left for consumption by wildlife as an alternative food source. This approach provides relief for critical crops by sacrificing less important or specifically planted fields. For lure crops to be successful, frightening techniques may be necessary in fields where crops are to be protected; wildlife should not be disturbed in sacrificial fields.

Establishing lure crops is expensive, requires considerable time and planning to implement, and may attract other unwanted species to the area, causing additional wildlife damage problems. Also, there are potential legal consequences regarding hunting near lure crops, which must be considered before lure crops or alternate foods are used.

3. Frightening Devices

The success of frightening methods depends on animals' fear of, and subsequent aversion to offensive stimuli. Once animals become habituated to a stimulus, they often resume their damaging activities. Persistent effort is usually required to consistently apply frightening techniques and then vary them sufficiently to prolong their effectiveness. Over time, some animals learn to ignore commonly used scare tactics. In many cases animals

frightened from one location become a problem at another. The effects of frightening devices on nontarget wildlife need to be considered. For example, sensitive birds may be disturbed or frightened from nesting sites.

a. Electronic Distress Sounds

Distress and alarm calls of various animals have been used singly and in conjunction with other scaring devices to successfully scare or harass animals. Many of these sounds are available on records and tapes. Calls should be played back to the animals from either fixed or mobile equipment in the immediate or surrounding area of the problem. Animals react differently to distress calls; their use depends on the species and the problem. Calls may be played for short (few second) bursts, for longer periods, or even continually, depending on the severity of damage and relative effectiveness of different treatment or "playing" times. Some artificially created sounds also repel birds in the same manner as recorded "natural" distress and alarm calls.

b. Propane Exploders

Propane exploders operate on propane gas and are designed to produce loud explosions at controllable intervals. They are strategically located (elevated above the vegetation, if possible) in areas of high wildlife use to frighten wildlife from the problem site. Because animals are known to habituate to sounds, exploders must be moved frequently and used in conjunction with other scare devices. Exploders can be left in an area after dispersal is complete to discourage animals from returning.

c. Pyrotechnics

Double shotgun shells, known as shellcrackers or scare cartridges, are 12-gauge shotgun shells containing a firecracker that is projected up to 75 yards in the air before exploding. They can be used to frighten birds or mammals but are most often used to prevent crop depredation by birds or to discourage birds from undesirable roost locations. The shells should be fired so they explode in front of, or underneath, flocks of birds attempting to enter crop fields or roosts. The purpose is to produce an explosion between the birds and their objective. Birds already in a crop field can be frightened from the field; however, it is extremely difficult to disperse birds that have already settled in a roost.

Noise bombs, whistle bombs, racket bombs, and rocket bombs are fired from 15 millimeter flare pistols. They are used similarly to shellcrackers but are projected for shorter distances. Noise bombs (also called bird bombs) are firecrackers that travel about 75 feet before exploding. Whistle bombs are similar to noise bombs, but whistle in flight and do not explode. They produce a noticeable response because of the trail of smoke and fire, as well as the whistling sound. Racket bombs make a screaming noise in flight and do not explode. Rocket bombs are similar to noise bombs but may travel up to 150 yards before exploding.

A variety of other pyrotechnic devices, including firecrackers, rockets, and Roman candles, are used for dispersing animals. Firecrackers can be inserted in slow-burning fuse ropes to control the timing of each explosion. The interval between explosions is determined by the rate at which the rope burns and the spacing between firecrackers.

d. Lights

A variety of lights, including strobe, barricade, and revolving units, are used with mixed results to frighten birds. Brilliant lights, similar to those used on aircraft, are most effective in frightening night-feeding birds. These extremely bright-flashing lights have a blinding effect, causing confusion that reduces the bird's ability to catch fish.

Flashing amber barricade lights, like those used at construction sites, and revolving or moving lights may also frighten birds when these units are placed on raceway walls or fish pond banks. However, most birds rapidly become accustomed to such lights and their long-term effectiveness is questionable. In general, the type of light, the number of units, and their location are determined by the size of the area to be protected and by the power source available.

e. Water Spray Devices

Water sprays from rotating sprinklers placed at strategic locations in or around ponds or raceways will repel certain birds, particularly gulls. However, individual birds may become accustomed to the spray and feed among the sprinklers. Best results are obtained when high water pressure is used and the sprinklers are operated with an on-off cycle. The sudden startup noise also helps frighten the birds.

f. Harassment

Scaring and harassment techniques to frighten animals are probably the oldest methods of combating wildlife damage. A number of sophisticated techniques have been developed to scare or harass wildlife from an area. The use of noise-making devices is the most popular and commonly used; however, other methods, including aerial hazing and visual stimuli, are also used. Harassment using vehicles, people, falcons or dogs is used to frighten predators or birds from the immediate vicinity. Boats, planes, automobiles, and all-terrain vehicles are used as harassment methods. As with other wildlife damage control efforts, these techniques tend to be more effective when used collectively in a varied regime rather than individually. However, the continued success of these methods frequently requires reinforcement by limited shooting (see Shooting).

g. Other Scaring Devices

Owl decoys, reflective Mylar tape, scarecrows, ribbons, plastic bags, suspended pie pans, and helium-filled balloons may be used as scaring devices. Their effectiveness is enhanced when they are used in conjunction with auditory scare devices. The Electronic Guard, a portable unit that houses a strobe light and siren has been developed by the Denver Wildlife Research Center and is produced by the Pocatello Supply Depot. In certain situations, this device has been used successfully to reduce coyote depredation on sheep. The device activates automatically at nightfall and is programmed to discharge periodically throughout the night. The technique has proven most successful when used at "bedding grounds" where sheep gather to sleep for the night.

4. Chemical Repellents

Chemical repellents are compounds that prevent consumption of food items or use of an area. They operate by producing an undesirable taste, odor, feel, or behavior pattern.

Effective and practical chemical repellents should be nonhazardous to wildlife; nontoxic to plants, seeds, and humans; resistant to weathering; easily applied; reasonably priced; and capable of providing good repelling qualities. The reaction of different animals to a single chemical formulation varies, and for any species there may be variations in repellency between different habitat types.

Several paste repellents are used to repel birds around structures. These are grease-like materials that are either sprayed or applied with a caulking gun to window sills, ledges, or similar perches to discourage birds. They are most frequently used in urban areas to control pigeon and starling problems.

The avian frightening agent Avitrol (4-aminopyridine) is used to deter birds from specific crops and areas. Avitrol is a toxic chemical but is used as an area repellent. It is used primarily to control flocking blackbirds and starlings that cause crop depredation problems, but it may also be used to control gulls, pigeons, sparrows, and crows. Avitrol is applied as a mixture of treated and untreated grain. After prebaiting with untreated grain to establish a satisfactory feeding pattern, the treated mixture is placed for consumption by the target flock of birds. The few birds that eat treated grain usually die, but in the process they emit distress calls and fly erratically. A large number of untreated birds in the flock will respond to the distress calls of the few affected individuals. This behavior frightens the other birds in the flock from the area.

Avitrol is also used to repel gulls from garbage dumps and airports. Caution must be exercised when Avitrol is used for this purpose because gulls tend to fly in a spiraling or towering pattern over bait sites when reacting to birds that exhibit distress symptoms. The towering behavior of gulls may temporarily create a bird collision hazard for aircraft operations.

Development of chemical repellents is expensive and cost prohibitive in many situations. Chemical repellents are strictly regulated, and suitable repellents are not available for many wildlife species or wildlife damage situations.

5. Kill or Relocation Methods

a. Leghold Traps

Leghold traps are used to capture animals such as the coyote, bobcat, fox, mink, beaver, raccoon, skunk, muskrat, nutria, and mountain lion. These traps are the most versatile and widely used tool for capturing these species. They are used in both terrestrial and shallow aquatic environments. The leghold trap can be set under a wide variety of conditions but can be difficult to keep in operation during rain, snow, or freezing weather. When placed without baits in the travel lanes of target animals, leghold traps are known as "trail sets." More frequently, traps are placed as "baited sets," meaning that they are used with a bait consisting of the animal's preferred food or some other lure, such as fetid meat, urine, or musk, to attract the animal. In some situations a "draw station," such as a carcass or large piece of meat, is used to attract target animals. In this approach, one to several traps are placed in the vicinity of the draw station. APHIS ADC program policy prohibits placement of traps closer than 30 feet to the draw station. This provides protection to scavenging birds.

Various tension devices can be used to prevent animals smaller than target animals from springing the trap. Effective trap placement also contributes to trap selectivity; however, livestock and nontarget animals may still be captured. These traps usually permit the release of nontarget animals.

Pole traps can be effectively used to capture raptors (hawks and owls) because of their behavioral tendency to perch on isolated limbs, poles, and other prominent structures. One to several poles, 5 to 10 feet high, are erected and a padded-jaw leghold trap (usually size $1^1/_2$) is set on the top of each pole. A steel wire is passed through the trap chain and attached to the top and base of the pole to allow the trap and bird to slide to the ground after being captured.

Before leghold traps are employed, their limitations must be considered. Injury to target and nontarget animals, including livestock, may occur. Weather and the skill of the user will often determine the success or failure of the leghold trap in preventing or stopping wildlife damage.

b. Cage Traps

A variety of cage traps are used in different wildlife damage control efforts. The most commonly known cage traps used in the current program are box traps. Box traps are usually rectangular, made from wood or heavy gauge mesh wire. These traps are used to capture animals alive and can often be used where many lethal or more dangerous tools would be too hazardous. Box traps are well suited for use in residential areas.

Cage traps usually work best when baited with foods attractive to the target animal. They are used to capture animals ranging in size from mice to deer, but are usually impractical in capturing most large animals. They are virtually ineffective for coyotes; however, large cage traps work well to capture bears and have shown promise for capturing mountain lions, provided the traps can be transported by vehicle to the control sites.

Cage traps made of flexible mesh wire are effective for capturing beaver in some situations. Resembling fully or partially open suitcases when set, these traps are best suited for use in fairly shallow water at the beavers' entrance and exit routes or in water travel lanes. The traps can be baited with an ear of corn or a fresh piece of aspen, cottonwood, willow, or other woody plant.

Large decoy traps, modeled after the Australian crow trap, are used to capture starlings, blackbirds, crows, and ravens. They are large screen enclosures with the access modified to suit the target species. A few live birds are maintained in the baited trap to attract birds of the same species and, as such, act as decoys. Nontarget species are released unharmed.

There are some animals that avoid cage traps and others that become "trap happy" and purposely get captured to eat the bait, making the trap unavailable to catch other animals. Cage traps must be checked frequently to ensure that captured animals are not subjected to extreme environmental conditions. Some animals fight to escape from cage traps and become injured.

c. Snares

Snares made of wire or cable are among the oldest existing control tools. They can be used effectively to catch most species but are most frequently used to capture coyotes, beaver, and bears. They have limited application but are effective when used under proper conditions. They are much lighter and easier to use than leghold traps and are not generally affected by inclement weather.

Snares may be employed as either lethal or live-capture devices depending on how and where they are set. Snares set to capture an animal by the neck are usually lethal, whereas snares positioned to capture the animal around the body can be useful live-capture devices. These snares can be effectively used wherever a target animal moves through a restricted lane of travel (i.e., "crawls" under fences, trails through vegetation, or den entrances). When an animal moves forward into the loop formed by the cable, the noose tightens and the animal is held.

The foot or leg snare is a spring-powered nonlethal device, activated when an animal places its foot on the trigger. Foot snares are used effectively to capture both grizzly and black bears and mountain lions.

In some situations using snares to capture wildlife is impractical due to the behavior or animal morphology of the animal, or the location of many wildlife conflicts. Snares must be set in locations where the likelihood of capturing nontarget animals is minimized.

The catch-pole snare is used to capture or safely handle problem animals. This device consists of a hollow pipe with an internal cable or rope that forms an adjustable noose at one end. The free end of the cable or rope extends through a locking mechanism on the end opposite of the noose. By pulling on the free end of the cable or rope, the size of the

noose is reduced sufficiently to hold an animal. Catch poles are used primarily to remove live animals from traps without danger to or from the captured animal.

d. Quick-Kill Traps

A number of specialized "quick-kill" traps are used in wildlife damage control work. They include Conibear, snap, gopher, and mole traps.

Conibear traps are used mostly in shallow water or underwater to capture muskrat, nutria, and beaver. The Conibear consists of a pair of rectangular wire frames that close like scissors when triggered, killing the captured animal with a quick body blow. Conibear traps have the added features of being lightweight and easily set.

Snap traps are common household rat or mouse traps usually placed in buildings. These traps are often used to collect and identify rodent species that cause damage so that species-specific control tools can be applied. If an infestation is minor, these traps may be used as the primary means of control. Glue boards (composed of shallow, flat containers of an extremely sticky substance) are also used as an alternative to snap traps.

Spring-powered harpoon traps are used to control damage caused by surface-tunneling moles. Soil is pressed down in an active tunnel and the trap is placed at that point. When the mole reopens the tunnel, it triggers the trap and is killed. Two variations of scissor-like traps are also used in burrows for both mole and pocket gopher population control.

Some quick-kill traps are potentially dangerous to people and cannot be used in populated areas. Quick-kill traps are available only for a limited number of species.

e. Denning

Denning is the practice of seeking out the dens of depredating coyotes or red fox and destroying the young, adults, or both to stop or prevent depredations on livestock. Denning is used in coyote and red fox damage control efforts primarily in the western States. The usefulness of denning as a damage control method is limited because coyote and red fox dens are difficult to locate in many parts of the country and den use is restricted to approximately 2 to 3 months during the spring.

Coyote and red fox depredations on livestock and poultry often increase in the spring and early summer because of the increased food requirements caused by the need to feed pups. The removal of pups will often stop depredations even though the adults are not taken. When the adults are taken it is customary to kill the pups to prevent their starvation. In this method, pups are removed from dens by excavation and then shot, or they are killed in the den with a registered fumigant. Denning is highly selective for the target species and family groups responsible for damage.

Den hunting for adult coyotes and fox and their young is often combined with calling and shooting.

Denning can be labor intensive with no guarantee of finding the den of the target animal.

f. Shooting

Shooting is used selectively for target species but may be relatively expensive because of the staff hours sometimes required. Nevertheless, shooting is an essential control method. Removal of one or two problem woodpeckers, for example, can stop extensive woodpecker damage to residences or other buildings. Removal of beaver may be achieved by night shooting because beaver are primarily active at that time. Many airports have perimeter fences for security purposes that also confine resident deer populations. These deer frequently stray onto active runways and pose a significant threat to aircraft. Removal of these deer may be effectively achieved by shooting.

Lethal reinforcement through shooting is often necessary to ensure the continued success in bird scaring and harassment efforts (see the discussion on shooting under Modification of Human Behavior). This is especially important where birds are drawn by ripening crops, aquaculture and mariculture facilities, sanitary landfills, and other locations where food is readily available. In situations where the feeding instinct is strong, most birds quickly adapt to scaring and harassment efforts unless the control program is periodically supplemented by shooting.

Shooting is frequently performed in conjunction with calling particular predators such as coyotes, bobcats, and fox. Trap-wise coyotes are often vulnerable to calling.

Shooting from aircraft, or aerial hunting, is a commonly used coyote damage control method. Aerial hunting is species-selective and can be used for immediate control where livestock losses are severe if weather, terrain, and cover conditions are favorable. Aerial hunting can be effective in removing offending coyotes that have become "bait-shy" or are not susceptible to calling and shooting. Local depredation problems can often be quickly resolved by the use of aerial hunting.

Fixed-wing aircraft are useful for aerial hunting over flat and gently rolling terrain. Because of to their maneuverability, helicopters have greater utility and are safer over , timbered areas, or broken land where animals are more difficult to spot. In broken timber or deciduous ground cover, aerial hunting is more effective in winter when snow cover improves visibility.

The APHIS ADC program aircraft-use policy helps ensure that aerial hunting is conducted in a safe and environmentally sound manner, in accordance with Federal and State laws. Pilots and aircraft must be certified under established APHIS ADC program procedures. Only properly trained APHIS ADC program employees are approved as gunners.

Shooting is limited to locations where it is legal and safe to discharge firearms. Shooting may be ineffective for controlling damage by some species and may actually be detrimental to control efforts. For example, ill-advised attempts to move winter roosts of blackbirds with live ammunition cripple some birds. These birds remain in the trees, and by their presence and noise often lure other birds to the roost site.

g. Hunting Dogs

Dogs are essential to successful hunting of mountain lion and bear. Dogs trained for coyote denning are also valuable in luring adult coyotes to be shot. Trained dogs are used primarily to locate, pursue, or decoy animals.

Training and maintaining suitable dogs requires considerable skill, effort, and expense. There must be sufficient need for dogs to make the effort worthwhile.

h. Egg, Nest, and Hatchling Removal and Destruction

Nesting populations of cattle egrets and gulls, especially if located near airports, may pose a threat to public health and safety, as well as equipment. Pigeons and starlings can also cause extensive damage to public facilities. Egg and nest destruction is used mainly to control or limit the growth of a nesting population in a specific area through limiting reproduction of offspring or removal of nest to other locations. Egg and nest destruction is practiced by manual removal of the eggs or nest.

This method is practical only during a relatively short time interval and requires skill to properly identify the eggs and hatchlings of target species. Some species may persist in nesting and the laying of eggs, making this method ineffective.

6. Chemical Toxicants

Several toxic chemicals have been developed to control wildlife damage and are widely used because of their efficiency. Toxicants are generally not species specific, and their use may be hazardous unless used with care by knowledgeable personnel. The proper placement, size, type of bait, and time of year are keys to selectivity and successful control. Development of appropriate toxicants is expensive, and the path to a suitable end product is filled with legal and administrative hurdles. Few private companies are inclined to undertake such a venture. Most chemicals are aimed at a specific target species, and suitable chemicals are not available for most animals. Available delivery systems make the use of chemical toxicants unsuitable in many wildlife damage situations. This section describes the chemical toxicants used in the present APHIS ADC program.

Zinc phosphide is a metallic toxicant most often used for rat, vole, muskrat, and nutria damage control. Zinc phosphide baits are prepared with sweet potatoes, carrots, or apples for nutria and muskrat damage control, and with apples, cracked corn, or oats for vole control. Canned dog and cat food treated with zinc phosphide is used for rat control. Zinc phosphide is coated (using vegetable oil) or dusted on the bait; the baits are then tumbled to ensure even distribution. The odor of zinc phosphide is attractive to rodents but repulsive to most other animals. Tarter emetic is sometimes added to baits used to control rats. This safety feature will cause most other species to regurgitate any zinc phosphide baits they may consume. Its effectiveness for rat control is not compromised because rats are unable to regurgitate.

Treated baits for muskrats can be placed in their burrows, into their runways, or on rafts anchored in the vicinity of damage. Raft baiting can also be effective for nutria. Application of zinc phosphide baits for vole control varies according to each situation and species involved. Baits are either broadcast on the surface or placed in underground runways using the trail builder, a variation of the burrow builder (see the description below under strychnine). Trail builders are used to control vole damage in orchards or other ornamental or commercial tree plantings. Zinc phosphide-treated grain baits are widely used for controlling rodent damage in forests and prairie dog damage in rangelands.

Several anticoagulant rodenticides are used to control commensal rodents and some field rodents around buildings and other structures. Common anticoagulants include warfarin and diphacinone. Anticoagulants are normally classified as multiple-dose toxicants. For the materials to be effective, animals must feed on the bait more than once. However, some newer formulations only require a single feeding to be effective. Bait for rats and mice must be continuously available for 2 to 3 weeks for effective population control. Anticoagulants may be mixed with water or with dry bait, such as rolled oats, corn meal, cracked grains, or presented in combination.

Strychnine is a white, bitter-tasting toxicant that is very toxic to most mammals and birds, with the exception of gallinaceous birds, which are relatively resistant. Strychnine has been used on grain baits for aboveground use to control damage caused by various field rodents, pigeons, and house sparrows. However, in 1988 all aboveground uses were temporarily canceled.

For below-ground use in reducing pocket gopher populations, strychnine is dispensed using the tractor-drawn burrow builder, which constructs an underground artificial burrow and places strychnine-treated oat baits in the simulated gopher burrow. The artificial burrows are constructed 20 to 60 feet apart, usually at a depth of 8 to 12 inches. During their underground travels, the gophers intersect the artificial burrows, consume the toxic bait, and die underground. Gopher damage can also be controlled by hand placement of the toxicant in the natural burrow system. These methods of application are used in both agricultural and forest areas where gophers are a problem.

Porcupine blocks are short lengths of 2- by 4-inch lumber that are treated with a mixture of strychnine and salt. They are used in nonagricultural areas to control porcupine damage to trees. The blocks, treated with salt, are attractive to porcupines. In application, the blocks are nailed to tree trunks about 8 inches above a large branch and 10 feet or more above the ground or snow line. However, porcupine blocks are no longer used. The registration was voluntarily withdrawn in 1989.

Sodium cyanide is used in the M-44, a spring-activated ejector device developed specifically to kill coyotes and other canine predators. The M-44 device consists of a capsule holder wrapped with fur, cloth, or wool; a capsule containing 0.8 gram of powdered sodium cyanide; an ejector mechanism; and a 5- to 7-inch hollow stake. The hollow stake is driven into the ground, the ejector unit is cocked and placed in the stake, and the capsule holder containing the cyanide capsule is screwed onto the ejector unit. A fetid meat bait is spread on the capsule holder. An animal attracted by the bait will try to pick up or pull the baited capsule holder. When the M-44 is pulled, a spring-activated plunger propels sodium cyanide into the animal's mouth.

Compound 1080, or sodium fluoroacetate, has been widely used as a rodenticide since the mid-1940s. It was also used in predacide baits prior to 1972. Currently, the only registered use of this chemical is in controlling predators with the Livestock Protection Collar (LP Collar).

Fumigants or gases used to control burrowing wildlife are efficient but often expensive. In the APHIS ADC program, fumigants are only used in rodent burrows and in predator dens. The APHIS ADC program manufactures at the Pocatello Supply Depot, and uses den cartridges especially formulated for these purposes. The cartridges are placed in the active burrows of target animals, the fuse is lit, and the entrance is then tightly sealed with soil. The burning cartridge causes death by oxygen depletion and carbon monoxide poisoning. Aluminum phosphide tablets are also used as a fumigant in prairie dog burrows.

Starlicide baits, containing DRC-1339, are commercially available to control starlings and blackbirds in cattle and hog feedlots and poultry yards. DRC-1339 is highly toxic to starlings and blackbirds, well accepted by these species, relatively nontoxic to mammals, and generally of low toxicity to most other birds. Poultry pellet baits are placed in feeding stations or scattered outside feed bunkers. After ingesting the baits, most of the birds die away from the roost site. This material is most effective in northern areas when snow covers most food supplies, causing starlings to congregate in feedlots.

Starlicide is available to the public only in poultry pellets containing a low concentration of the chemical. Best results with this formulation are achieved when similar pellets are being used as livestock feed in the problem area.

DRC-1339 concentrate is used effectively in hard-boiled eggs to control raven damage under several State-specific registrations for the protection of livestock and certain endangered species. It is also registered for application on various materials, such as grain, meat baits, sandwich bread, and cull French fries to control pigeons, gulls, crows, ravens, blackbirds, and starlings. DRC-1339 concentrate is only available for use under APHIS ADC program supervision.

The avian stressing agent PA-14 is used to reduce populations of roosting blackbirds and starlings during the winter months. PA-14 is a surfactant that lowers the surface tension of water. When sprayed on birds, the chemical action of the surfactant breaks down the oil in the feathers, removing the natural waterproofing. When the feathers become soaked and matted from a combination of PA-14 solution and water, the insulating effect of the feathers is lost. This results in increased heat conductivity from the bird's body, and is enhanced by evaporation. If temperatures are low enough, the energy loss cannot be offset by increased metabolism; therefore, the body temperature of treated birds eventually drops to a lethal level. This is the only toxicant currently registered to control blackbirds and starlings at winter roosts.

Appendix K

Chemicals Used by the Denver Wildlife Research Center in FY 1988

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K Appendix

Table K-1

Bird Damage Control Chemicals Used by the DWRC in FY 1988

Chemical	Common Name	Supplier	Control Number	Amount (a.i.)
3-chloro-4-methylbenzenamine hydrochloride (3-chloro-p-toluidine hydrochloride)	Starlicide Complete	Purina Mills St. Louis, MO	None	125.0 g
	DRC-1339	Purina Mills St. Louis, MO	None	24.0 g
	DRC-1339	Purina Mills St. Louis, MO	State Research Authorization	10.4 g
	DRC-1339	Purina Mills St. Louis, MO	EPA SLN No. AZ860006	26.8 g
N-(3-chloro-4-methylphenyl) acetamide	CAT, DRC-2698	Eastman Chemical Products, Inc. Rochester, NY	None	131.7 g
Methiocarb (4-methylthio-3, 5-xylylmethylcarbamate	Mesurol	Mobay Chemical Corp. Kansas City, MO	EPA Reg. No. 3125-288	5.0 kg
Alpha-chloralose	NA	Aldrich Chemical Milwaukee, WI	None	67.0 g
	NA	Aldrich Chemical Milwaukee, WI	None	1.0 g
Dimethyl anthranilate	DMA	National Starch and Chemical Co. Bridgewater, NJ	DWRC QA-39	18.3 kg
	DMA	National Starch and Chemical Co. Bridgewater, NJ	None	45.5 kg
Methyl anthranilate	MA	National Starch and Chemical Co. Bridgewater, NJ	DWRC QA-39	18.1 kg

Formulation	Application Method	Size of Area Treated	Location	Target Species	Mode of Action
DRC-1339 (0.1%) Poultry pellets	Bait exposed in containers	192 ft^2	Sullivan Co., TN	Starlings	Toxicant
DRC-1339 (1.6-3.2%) Margarine - Bread	Ground bait	10.0 acres	Erie Co., OH	Herring gulls	Toxicant
DRC-1339 (10%) Water - Egg (1 ml per egg)	Ground bait	13.0 acres	San Diego Co., CA	Ravens	Toxicant
DRC-1339 (10%) Water - Egg (1 ml per egg)	Ground bait	1.2 acres	Coconino Co., AZ	Ravens	Toxicant
DRC-2698 (0.02%) Brown rice 1% Alcolec S (sticker)	Broadcasted ground bait	8.7 acres	Evangeline Parish, LA	Blackbirds (primarily red-winged blackbirds)	Toxicant
Mesurol 75% WP Water	Spray on cherry trees	10.0 acres	Columbiana Co., NY	Grackles, robins, starlings, other songbirds	Repellent
Alpha-chloralose (4-16%) Margarine - Bread	Ground bait	10.0 acres	Erie Co., OH	Herring gulls	Toxicant/ Capture Agent
Alpha-chloralose (5%) Margarine - Bread	Ground bait	1.0 acre	Cuyahoga Co., OH	Canada geese	Capture Agent
DMA (9 lbs a.i. per 100 gal) Casein (sticker 15%) Water (85%)	Spray on grass	13.4 acres	Summit Co., NJ	Canada geese	Repellent
DMA (0.5-1.0%) Food grade starch	Mixed in livestock feed. Exposed in feed troughs.	<500 ft^2	Warren Co., KY	Starlings, blackbirds	Repellent
MA (9 lbs a.i. per 100 gal) Casein (sticker 15%) Water (85%)	Spray on grass	13.3 acres	Summit Co., NJ	Canada geese	Repellent

Table K-2

Mammal Damage Control Chemicals Used by the DWRC in FY 1988

Chemical	Common Name	Supplier	Control Number	Amount (a.i.)
Sodium Cyanide	M-44 Cyanide Capsules	Pocatello Supply Depot Pocatello, ID	QAI5	306 g
Strychnine Alkaloid	Strychnine oats	H. Interdonati, Inc. Cold Springs, NY	QA44	8.6 g
	Boomer-Rid	Oregon Rodent Control Outfitters Eugene, OR	None	3.1 g
	4.9% strychnine paste	Pocatello Supply Depot Pocatello, ID	None	3.8 g
	4.9% strychnine paste	Pocatello Supply Depot Pocatello, ID	None	<50 g
Putrescent Egg	Big Game Repellent (BGR-P)	McLaughlin Gormley King Portland, OR	None	<3.6 kg
Zinc Phosphide	ZP Tracking Powder	Bell Laboratories Madison, WI	None	10 g
Aluminum Phosphide	Rotox gas tablets	Research Products, Co. Salina, KS	None	<285 g
Charcoal-Sodium Nitrate	Gas cartridge	Pocatello Supply Depot Pocatello, ID	None	2 kg
Diphacinone	Eaton's Answer	J.T. Eaton, Co. Twinsburg, OH	None	0.26 g
	Mongoose beef bait	Bell Laboratories Madison, WI	56228- EUP-5	1.25 g
Tetramethyl Thiuram Disulfide	Thiram or TMTD (Scram S-42)	Wilbur Ellis, Inc. Portland, OR	None	1.68 ltr
Undetermined (animal tissue)	Powdered starlings	Made at DWRC field station Olympia, WA	None	400 g

[a] This study did not involve animals. Ejectors were test-pulled by investigators to determine mechanical performance.

Formulation	Application Method	Size of Area Treated	Location	Target Species	Mode of Action
89% a.i. dry powder; 0.91 g per capsule	Ejected from M-44 devices	0.03 acre	Custer & Treasure Counties, MT	None[a]	NA[a]
0.5, 0.75, 1.10, and 1.25% a.i. on oat groats	Hand placed in gopher burrows	3.2 acres	Klickitat County, WA	Northern pocket gophers	Toxicant
0.31% a.i. in pellets	Placed in underground burrows	2 acres	Thurston County, WA	Mountain beavers	Toxicant
0.29% strychnine on fresh alfalfa tips	Placed in undergound burrows	<5 acres	Kittitas County, WA	Marmots	Toxicant
0.29% strychnine on sword fern or apples	Placed in underground burrows	<5 acres	Thurston County, WA	Mountain beavers	Toxicant
36% putrescent egg with adhesives & bulking agent	Dust applied to wetted foliage	<20 acres	Thurston, Grays Harbor, and Mason Counties, WA	Mountain beavers	Repellent/ aversive agent
10% a.i. powder	Dusted in burrow and on target animals	0.1 acre	Thurston County, WA	Mountain beavers	Toxicant
57% a.i. ammonium carbamate & urea (pellets or tablets)	Placed in burrows	2 acres	Thurston, Grays Harbor Counties, WA	Mountain beavers	Toxic burrow fumigant
Powder containing 65% sodium nitrate & 35% charcoal	Placed in burrows	1 acre	Thurston County, WA	Mountain beavers	Toxic burrow fumigant
0.0052% bait blocks	Placed in burrows	<1 acre	Thurston County, WA	Mountain beavers	Toxicant
2.5 ppm in beef hamburger	Offered in bait stations	2.75 km^2	Oahu, HI	Mongoose	Toxicant
42% water solution, diluted to 21% a.i. w/sticker (Rhoplex)	Sprayed on douglas fir seedlings	1 acre	Thurston County, WA	Mountain beavers	Repellent/ aversive agent

Appendix L

Comments on the Draft and the Supplement to the Draft EIS, and APHIS Responses

Appendix L

Comments on the Draft Environmental Impact Statement, and APHIS Responses

Introduction

On July 2, 1990, the Animal and Plant Health Inspection Service (APHIS), U.S. Department of Agriculture (USDA), issued the Draft Environmental Impact Statement (DEIS) for the Federal/Cooperative Animal Damage Control (ADC) program. On January 13, 1993, the Supplement to the Draft Environmental Impact Statement (SEIS) was issued with changes based on comments on the DEIS. This Appendix describes the process used by APHIS for responding to public comments on both the SEIS and DEIS. The Appendix also shows how comments received on the DEIS and SEIS resulted in substantive changes in this final Environmental Impact Statement (EIS).

The Appendix includes the following information:

- A description of the process used to invite comments on the DEIS.
- A description of the approach used to analyze and consolidate the comments.
- The consolidated comments, responses to them, changes in responses based on comments to the DEIS and SEIS, and the changes in this EIS.
- A list of commentors and indices showing their comments are included in the consolidated comments. An additional listing is given of commentors and an index to their comments relating to the existing common comments as well as any new consolidated comments. This EIS is a programmatic document that focuses on the national program rather than site-specific projects. Accordingly, the alternatives identified were those appropriate to a nationwide program.

The DEIS and SEIS identified 11 alternatives for program implementation. Three alternatives were not presented in detail in the DEIS because they were biologically unsound, impractical to implement, socially unacceptable, or incomplete; i.e., did not address the full range of wildlife damage problems that a comprehensive, national program must address. Five alternatives were not presented in detail because their potential impacts were similar to those of the three alternatives that were documented in detail. These three alternatives were the following:

- The Current Program Alternative, which would provide for a Federal/cooperative APHIS ADC program accomplished through an integrated pest management approach.
- The Damage Compensation Program Alternative, which would provide for full or partial compensation for agricultural losses from wildlife damage, rather than efforts to directly control such damage.

- The No Action Alternative, which would provide for an end to APHIS funding of wildlife damage management activities.

The SEIS and DEIS identified the Current Program Alternative as APHIS's preferred alternative. Considered on a programmatic basis, no significant adverse national impacts were anticipated to result from implementation of the Current Program Alternative. The SEIS and DEIS indicated that the potential existed for local wildlife populations to be adversely impacted by some APHIS ADC activities and that some groups could experience adverse sociocultural impacts.

In response to comments about the SEIS, two new alternatives were developed and analyzed in detail in this final EIS. They are:

- A Nonlethal Control Program Alternative which would restrict APHIS ADC to providing or recommending nonlethal methods only.
- A Nonlethal Before Lethal Program Alternative which would require that nonlethal methods be used prior to recommending or implementing lethal control activities.

The APHIS ADC DEIS and SEIS were provided to the organizations and individuals listed in Appendix E as well as to those who requested a copy in response to the Notice of Availability published in the Federal Register. A 90-day comment period was allowed for the DEIS and a 96-day comment period was allowed for the SEIS, closing April 28, 1993. Oral presentations at public hearings and written comments provided input from 1,402 persons or organizations on the DEIS and 90 individuals and organizations on the SEIS. A list of those individuals and organizations is included in this Appendix.

A Federal agency is required to invite comments from other Federal, State, and local agencies, Indian tribes, and the general public after issuing a DEIS (40 CFR 1503.1(a)). Further, the agency is required to respond to comments received (40 CFR 1503.4(a)). Possible responses (40 CFR 1503.4(a)) are to:

- Modify alternatives including the proposed action
- Develop and evaluate alternatives not previously given serious consideration by the Agency
- Supplement, improve, or modify the analyses
- Make factual corrections
- Explain why comments do not warrant further Agency response, citing the sources, authorities, or reasons that support the Agency's position.

Because the comments are consolidated, responses to individual comments are not provided. However, the path of individual comments through consolidation, response, and any resulting changes in the EIS is provided by the tables starting on page L-56.

Analysis of Comments and Development of Responses

As each letter was received, it was assigned a unique identification number. Similarly, each individual's public hearing testimony was assigned a number. These numbers and Tables L-1 and L-2 included in the last section of this Appendix enable a comment to be tracked. The steps are as follows:

- Consult Table L-1, which contains a list of individuals (listed alphabetically by last name) and organizations (also listed alphabetically) that submitted comments during the official comment period and the comment letter or hearing presentation number.
- Use the unique letter number to identify the relevant consolidated comment from Table L-2, which contains the list of consolidated comments and numbers of the letters from which each consolidated comment was derived.

- Read the appropriate consolidated comment and the APHIS response. The response provides a reply to the issues raised in the comment. The response also may identify changes made in the document or refer the commentor to the section of the document where relevant information can be found.

The DEIS comments are summarized, consolidated, and presented in the next section of this Appendix. The consolidated comments were developed by reading each letter and the hearing transcripts, marking each comment, and identifying common themes in these comments. Examples of such common themes include, "APHIS should conduct a cost-benefit analysis of the ADC program," "APHIS did not comply with NEPA requirements and procedures," and "ADC should have a public information program." Although comments resulted in common themes, they also provided unique explanatory material and additional discussion of the implications of each theme. The summaries identify the theme and summarize this additional material.

Additional comments to the SEIS comments are appended to the existing comments where they are related. Additional responses, clarifications, and analyses are appended to the responses or added directly to the text in the EIS itself.

Responses to the consolidated comments were written to: clarify or identify analyses or information already included in the DEIS or SEIS; refer the commentor to changes made in the EIS as a result of the comment; or explain why the comment does not warrant a response. A unique response was written for each comment that was not included in a consolidated comment.

The comments received on the DEIS and SEIS played an important and constructive role in developing this EIS. Specific changes to the DEIS or SEIS are noted in the responses to comments, however, some general changes resulting from the comment process should be noted. They include:

- Chapter 1 includes additional information regarding the purpose and need for the program.
- Chapter 2 includes an expanded description of the professional decisionmaking model used within APHIS ADC, and examples of the application of this model are included in Appendix N. The Chapter also includes a new table (Table 2-2) that is intended to clarify how potential program alternatives identified during scoping were addressed. In addition, Chapter 2 has been restructured for easier reading and has two new alternatives added.
- Chapter 4 includes the results of an assessment of the potential risks of APHIS ADC control methods, and the complete risk assessment is included as Appendix P.
- Chapter 4 also includes reanalyses of economic impacts of the No Action Alternative, Current Program Alternative, Nonlethal Control Program Alternative, Nonlethal Before Lethal Control Program Alternative, and Damage Compensation Control Alternative.
- Chapter 4 includes a summary statement that addresses how the impact assessment for the five alternatives presented in detail is related to the five alternatives not presented in detail in this EIS.
- Chapter 5 identifies additional mitigation measures not included in the DEIS as well as measures to assess the overall effectiveness of the APHIS ADC program and its compliance with environmental laws and regulations.

Consolidated Comments and Responses

COMMENT 1: Wildlife should not be killed by a Federal program.

Killing wildlife for the purpose of protecting livestock is wrong. Lethal control methods are "inhumane," "irresponsible," "environmentally damaging," and result in "needless slaughter." Taxpayers should not finance the "wasteful destruction of wildlife." The fundamental purpose of the APHIS ADC program and its conceptual basis are outdated. The program is "profoundly antagonistic" toward wildlife, and APHIS's goal is to "eradicate entire wildlife species." "Eradication of local populations" is not a "desirable" goal for ADC, and an effort that results in a "decrease in species diversity" cannot be a "successful" effort. The program should evolve with growing public sentiments that native wildlife have an inherent right to exist and should be respected and protected. Native wildlife is a greater resource than species introduced for commercial purposes. Animals have rights.

The program should be eliminated altogether or significantly modified to reflect the interests of the public majority rather than the interests of the livestock industry. The program should research nonlethal methods, such as guard dogs, fences, underground and aboveground barriers, strobe devices, sound husbandry practices, and direct compensation to livestock owners as alternatives to the current program. APHIS ADC should develop education programs for ranchers as well as for the general public that stress the importance of predators in a healthy ecosystem. The ADC program belongs with the US Fish and Wildlife Service (USFWS) so that wildlife protection is given adequate consideration.

APHIS ADC should stop using lethal methods immediately until definitive data can show that those methods are (1) effective in preventing losses, (2) the most cost-effective means of achieving quantitative objectives, and (3) not detrimental to wildlife populations. The APHIS ADC program must also include definitive analysis of economic consequences of various alternatives, which should include nonlethal methods. Direct compensation to livestock owners would be a more cost-effective alternative. Lethal controls do not provide a long-term solution for the livestock industry. It is senseless to kill large numbers of coyotes to protect sheep and other livestock on public lands. The industry is failing for a number of other reasons.

The DEIS is wrong in stating that environmental groups generally support the APHIS ADC program. Several environmental groups are opposed to the entire program as it "destroys wildlife." The idea that "animal welfare organizations are concerned that some methods used by the APHIS ADC program to control wildlife damage are inhumane" is a misrepresentation of the views of the environmental community. Many organizations are concerned about APHIS ADC's use of inhumane methods, not just animal welfare organizations.

RESPONSE: Wildlife damage management is accomplished through 1) damage prevention, 2) minimizing damage, and 3) stopping existing damage. In addressing wildlife damage problems, APHIS ADC seeks to find acceptable balances between human interests and wildlife needs. Control methods used or recommended by APHIS ADC include both nonlethal and lethal methods. Methods employed by APHIS ADC are used in a humane and environmentally responsible manner. In isolated circumstances, situations may dictate that APHIS ADC activities focus on removal or reduction of a local wildlife population. Compliance with environmental statutes (such as NEPA and the Endangered Species Act), agency Directives, and consultation with responsible agencies help to assure that wildlife populations are not jeopardized. APHIS ADC personnel recommend use of nonlethal methods whenever they would be effective and practical. To identify additional nonlethal methods for use in the program, APHIS ADC researches the use and effectiveness of nonlethal methods. Some of that research is referenced in this EIS (see Appendix P).

APHIS ADC's mission is to address situations in which differing human interests and values, involving wildlife and humans, come into conflict. From APHIS ADC's perspective, there are many ways to address such situations. The program considers many factors in determining appropriate control strategies. The process that APHIS ADC follows in

determining a recommended course of action to address such conflicts is presented in Chapter 2. As discussed in the wildlife damage management decision process, the economic cost effectiveness of methods or management strategies is often not the limiting factor determining APHIS ADC activities. Other factors include legal and administrative considerations and impacts of the damage, as well as potential control methods, on the biologic, physical, sociocultural, and economic environments. While the ideal goal is to prevent losses of resources and threats to human health and safety with no losses of wildlife, APHIS ADC recognizes that responsible wildlife management includes the removal of individual animals or reduction of local populations.

Cost considerations vary significantly from case to case. Lethal and nonlethal methods used by APHIS ADC are effective, efficient, and safely used in local areas. The GAO found that "according to available research, localized lethal controls have served their purpose in reducing such predator damage" (GAO 1990). Direct compensation would not be more cost-effective than the current APHIS ADC program because the total value of losses is greater than the cost of the current program. For example, studies cited in the Economic Impact Assessment in Chapter 4 place the total value of sheep and goats lost to wildlife damage in the vicinity of $20 to 25 million a year, and the total crop losses from bird damage in excess of $100 million a year. This amount does not address the value of losses to all other market and nonmarket resources or the build up of losses that would occur without control. As the Economic Impact Assessment emphasizes, APHIS ADC activities address nonagricultural resources, including human health and safety issues. In addition, the cost of verifying losses to justify compensation payments and the administrative costs of claims processing would be excessive. Similarly, as shown in the revised analysis of environmental impacts in Chapter 4, relying wholly on nonlethal methods would not necessarily be more cost effective than the current program. In general, such nonlethal approaches tend to be more costly than the mix of methods employed by APHIS ADC.

The EIS analysis of the attitudes of major segments of American society toward the APHIS ADC program is generally correct. The analysis highlights the varying interests and needs of the public regarding wildlife and the consequent variable demands placed on wildlife management agencies. These variable demands may be perceived by different segments of the public as conflicting or contradictory.

COMMENT 2: APHIS should prepare another Draft EIS.

The SEIS and DEIS should be withdrawn and redrafted. The SEIS and DEIS should be rewritten to adequately address the alternatives, nonlethal control methods, and direct compensation to livestock owners.

Neither the SEIS nor the DEIS established a need for the APHIS ADC program that was supported by substantive data. An acceptable range of alternatives (particularly nonlethal alternatives) should be developed and thoroughly analyzed. The analysis provided in the SEIS and DEIS was not adequate to support selection of the preferred alternative. The EIS should include a quantitative analysis of livestock and crop losses related to specific targeted "pest" species, an analysis of impacts on target and nontarget species, and an analysis of the range of lethal control methods used by APHIS ADC. The draft should distinguish between private and public lands. The analysis of public lands should reflect the multiple-use concept and increasing public concern for wildlife preservation.

The impact evaluation methodology ignores regional differences and the potentially different roles target species play in different geographical settings. The worst case analysis is inadequate and needs more baseline data. Obsolete data (25 years old) were used. One year of data is inadequate; at least 10 years of data should be used. The SEIS and DEIS should be completely revised and redistributed to the public for comment.

RESPONSE: Preparation of another Draft EIS has been determined to not be warranted based on the criteria in CEQ Regulations 40 CFR 1502.9. The Environmental Protection Agency reviewed the DEIS and SEIS and found both to be adequate, but recommended that additional data be provided. This has been done in the final EIS. In reviewing the comments on the DEIS and SEIS, APHIS determined that the scope of potential revisions was not extensive enough to require redrafting this document. However, additional alternatives, analyses, clarifications, and corrections were made based on comments received. The SEIS provided an opportunity to review these additional analyses. Specific reasons proposed by commentors as a basis for reissuing a Draft EIS are addressed in responses to other comments. A discussion of alternatives to the proposed action is contained in the response to Comment 4, as is the issue of the adequacy of analysis to support selection of the preferred alternative. Additional material regarding the purpose and need for the program has been added to Chapter 1. Data analyzing the value of potentially affected resource losses to wildlife damage have been added to the Economic Impact Assessment in Chapter 4. Impacts to target and nontarget species are addressed in the biological impact assessment in Chapter 4 and Appendix P. Issues with regard to the proper scope of impacts are addressed in the response to Comment 18. APHIS ADC control methods are described and analyzed in Appendices J and P; the responses to Comments 11 and 12 provide additional discussion. The issue of public and private lands is addressed in the response to Comment 19. The response to Comment 17 discusses the issue of regional and site-specific analysis in a programmatic document, and the responses to Comments 15 and 18 review the methodology used for the biological impact assessment. The selection of a data base (data for the year FY 1988) is discussed in the response to Comment 6.

COMMENT 3: The DEIS does not adequately describe the purpose and need for the APHIS ADC program.

The following elements of the purpose and need for the program were omitted from the DEIS and SEIS: (1) a statement of the underlying need for the program; (2) an adequate description of the current APHIS ADC program (its actual programs, both ongoing and planned); (3) the mission statement for the APHIS ADC program; (4) APHIS's strategic plan; (5) APHIS's goals and objectives for the ADC program; (6) the policy and philosophy of the APHIS ADC program; (7) the changes in the program since 1979; (8) future plans for the program; and (9) what would drive the preparation of a new EIS. Unless these omissions are adequately addressed, it is not possible for the public to fully understand the APHIS ADC program or evaluate the other methods that could be used to meet the underlying purpose of the APHIS ADC program.

An improved purpose and need section would better emphasize the need for wildlife damage control, the responsibility for carrying out such a program, and the various methods used to effectuate control. An improved analysis of purpose and need would identify the landscapes and environment in which problems have occurred and would also result in a list of nationally important pest species. APHIS should define ADC activities more clearly and accurately and explain how ADC is protecting the American public from "deer rubbing antlers on trees," "coyotes eating watermelons," or "ospreys eating minnows." A separate section should detail the kinds of problems caused by wild vertebrates or feral "domestics."

The purpose and need section should be rewritten to justify the APHIS ADC program on its own merits, not attempt to legitimize APHIS ADC based on wildlife management — a discipline with a completely different philosophical approach. APHIS should justify the need for the program both under current circumstances and in the future.

More emphasis should be given to wildlife damage prevention, especially in an Integrated Pest Management approach. The long-term goal for APHIS ADC should be to provide environmentally sound, biologically balanced, nonlethal controls that will reduce predation losses to a reasonable level so that over time the need for financial compensation will be reduced or eliminated. Research into effective nonlethal control methods should be shared by

other agricultural and environmental agencies. APHIS should find new ways to reduce conflicts between industry and wildlife. The APHIS ADC program failed to acknowledge a memorandum pertaining to the scope of ADC activities written by past Secretary of Interior Cecil Andrus, which stated that neither the livestock industry nor the environmental community is satisfied with the results or conduct of the ADC program and that ADC's goal should be to minimize and phase out the use of lethal preventive controls and achieve the long-term objective of preventing predator damage rather than controlling predators.

The DEIS and SEIS lack information as to why the western livestock industry consumes 75 percent of the APHIS ADC funds when evidence suggests that APHIS ADC activities, if any, should be directed at extreme damage to high value agricultural crops and protection of public health and safety.

The EIS should be reorganized so that the general public could more easily understand the contents. The EIS should indicate more clearly, in the opening summary and in Chapter 5, that the APHIS ADC program does not address all vertebrate pest problems and control in the U.S. and that APHIS ADC responsibility is negotiable in each state and changes constantly. Inconsistencies between APHIS ADC programs in different states and the reasons for variations should be described in the EIS. The APHIS ADC program does not protect grain products, although it has been estimated by some that the economic loss is greater for stored grain than some of the other resources listed in Chapter 3, page 1. It is not clear why predator species are removed to ensure adequate populations of game species in certain areas (Chapter 4, p. 63).

Tables 3-2 through 3-5 and the corresponding narrative suggest that all "resources" for which APHIS ADC received requests for "technical assistance" or "direct control" somehow ended up being "protected" by APHIS ADC. This appears to overstate the scope of APHIS ADC activities.

RESPONSE: Additional discussion regarding the purpose and need for the program has been included in Chapter 1. This discussion includes a statement of the need for program and additional material regarding the current program. The APHIS ADC Decision Model, which guides field implementation of the IPM approach, is outlined in detail in Chapter 2. The discussion of this model identifies management methods currently used for direct control and technical assistance and the factors considered in selection of an appropriate method. These materials supplement the information provided in Chapter 3 of the DEIS regarding the most common types of resources protected and estimates of wildlife damage to those resources. By including this information, the EIS provides a much clearer idea of the need for the APHIS ADC program as well the responsibilities involved in program operations and the use of control methods. Wildlife damage management is increasingly recognized as a part of the discipline of wildlife management. As contact (and potential conflicts) between humans and wildlife increases, the need for responsible wildlife damage management will also increase. APHIS recognizes the need for new ways to resolve conflicts between wildlife and humans and continues to pursue this objective through research efforts conducted by the Denver Wildlife Research Center. Secretary Andrus' memo is discussed in Chapter 1.

The resources protected by APHIS ADC vary from year to year. The Economic Impact Assessment in Chapter 4 documents resources protected for the years 1988-92. APHIS ADC assistance (through direct control or technical assistance) is potentially available to all resource owners; however, the resource owner must request assistance from the agency. Because the kinds of requests for both direct control and technical assistance vary, the resources protected also vary. The questions raised by the comment regarding why some resources are protected and others are not are explained by the "response to request" nature of the APHIS ADC program. This aspect of the program is described in Chapter 2.

Every effort has been made to make the EIS as reader friendly as possible. For example, Readers' Guides and chapter contents appear at the beginning of each chapter for quick

reference. CEQ regulations outline the basic structure of an EIS (see 40 CFR 1502.10 - 1502.19) as well as size limitations (40 CFR 1502.7).

COMMENT 4: The Draft EIS does not present an adequate number of reasonable alternatives to the current program. The alternatives presented are not analyzed adequately. The analysis is biased toward the preferred alternative.

The DEIS and SEIS did not adequately examine reasonable alternatives to the APHIS ADC program and justified the current program without adequately or fairly assessing the other alternatives. The process used in Chapter 2 to reduce the number of alternatives from 11 to three was inadequate. The two remaining alternatives ("No Action Alternative" and "Damage Compensation Program Alternative") also need to be analyzed more thoroughly. These alternatives were presented in such a way that they do not appear to be realistic possibilities. The agency has not "bridged the analytic gap between raw evidence and the preferred alternative," and the uninformed approval of an alternative has the potential to harm the environment and violate NEPA. A holistic view of the program is required so the public can accurately measure all alternatives. APHIS appears to have defined purpose and need synonymously in the SEIS. The alternatives developed for the EIS were developed as alternatives to the APHIS ADC program's mission, not as alternative ways to meet the underlying purpose for the program.

An EIS should be of sufficient depth to provide the agency with a sound basis for a reasoned decision, including (1) discussion of the "No Action" Alternative, (2) evaluation of different methods of achieving the objective that are outside the jurisdiction of the agency preparing the EIS, and (3) discussion of methods to partially satisfy the agency goal but do so with less detrimental environmental consequences. As stated by the First Circuit Court in the case of Commonwealth of Massachusetts vs. Watt, the reasonableness of alternatives should be determined "by how much the likely environmental harm will be reduced by another selection." The No Action Alternative in the DEIS is the "APHIS would do nothing at all approach" and is not practical because it does not meet the needs of wildlife damage control. A budget should be prepared for each of the alternatives considered in the DEIS to indicate how APHIS's goals will be prioritized and which goals will receive top consideration in the face of limited funds. It is misleading to refer to the APHIS ADC program as the proposed action when actually "no action" is more accurate because the continuation of the program results in no change. Therefore, the alternatives assessed in the DEIS do not help improve decisionmaking, which is the fundamental purpose of the NEPA process.

The current program was unfairly used as a standard to compare the alternatives. APHIS ADC operates on a double standard with regard to the use of lethal and nonlethal methods. Nonlethal methods must be 100 percent effective (all killing or destruction stopped) to justify their use. On the other hand, lethal means, regardless of their outcome, are always seen as successful. To justify the current program APHIS ADC implies that there are "good" animals and "bad" animals and that the killing of the "bad" animals is to protect and save the "good" animals.

Nonlethal alternatives must be analyzed, including taste aversives, herders, guard dogs, shed lambing, night corralling, pest-resistant crops, habitat modification, netting of aquaculture ponds, forms of birth control for target species, removal of livestock from areas of high loss, organic methods, humane leghold traps, better management methods of livestock and agriculture, and direct compensation to farmers and livestock owners for their losses. A certain number of losses due to wildlife predation have to be accepted by ranchers as an inherent risk of the business, or livestock owners should consider substituting beef cattle for sheep in areas where there is a high loss of sheep to predators. APHIS ADC needs to present acceptable loss levels in the EIS for public comment.

By shifting to nonlethal methods the APHIS ADC program can provide the agricultural industries with a long-term, environmentally sound approach to controlling wildlife damage, and compensation methods can be used in the short term, if necessary. Nonlethal alternatives would also shift the burden for damage prevention to the producer. The name ADC should be changed to "Wildlife Resource and Conservation Service," and the program should find new ways to conserve wildlife and reduce conflicts with agriculture and public health.

Most of the alternatives in the DEIS and SEIS are merely operational modifications of the current program. Only alternative six (transfer to private contractors) and alternative seven (transfer to the States) would result in a major change of responsibilities, and these two alternatives should be adequately analyzed. The DEIS criticizes alternatives that minimize APHIS ADC direct control, asserting that ranchers "take matters into their own hands" and assuming that these individuals would operate outside existing laws and regulations. The DEIS implied that States that do not have cooperative agreements with the APHIS ADC must be experiencing major problems, such as widespread illegal use of pesticides. The DEIS should have analyzed States where there is no operational Federal program and document the findings as part of the No Action Alternative. The State of Kansas has such a program, based on a self-help approach.

The document should explore converting direct control activities by APHIS to education and transferring technical assistance to the USDA Extension Service (ES). APHIS ADC would retain the supporting research program. Research techniques and pesticide registrations may best be guided by a centralized location. The EIS should reflect cooperation and coordination with other Federal and State agencies and private programs of wildlife damage control. Many APHIS ADC activities are similar to activities performed by State agencies; therefore, the potential for duplication of effort should be addressed in the EIS. The description of the alternative to convert direct control to education and technical assistance with transfer of all funds and responsibility to the ES ignores the present level of educational programs already being conducted by the ES nationwide.

The EIS should evaluate the transfer of $6 million in funds to the ES, USDA, to work directly with State cooperative research services. The "Missouri system," which performs equivalent services to the APHIS ADC program, is a program that has changed with public attitudes and is highly successful. Unless APHIS ADC discloses the actual effects of the ongoing ES program, the public cannot compare the APHIS ADC program with other alternatives.

The DEIS and SEIS are blatantly slanted towards the current program. The maps, studies, tables, and surveys provided in the SEIS were conducted by APHIS ADC personnel, making these data unreliable and biased towards the current program. APHIS did not take responsibility for the professional integrity of the documents. As a result, the preparers of the text were unable to analyze the information given to them by APHIS ADC personnel. None of APHIS ADC's recent administrative positions were filled on the basis of merit. The qualifications and promotion system employed by APHIS ADC in selecting is decision makers encouraged biased and uninformed decisions on APHIS ADC policy in violation of NEPA, of which the goal is to minimize the "risk to the environment." APHIS ADC decision makers can not effectively accomplish this goal because they are not professionally qualified to do so.

RESPONSE: All of the alternatives identified during scoping are described in Chapter 2. The No Action Alternative, Current Program Alternative, and Damage Compensation Program Alternative were selected for detailed analysis in the DEIS and SEIS because they appeared to have environmentally distinct impacts, covered the broadest range of impacts, and were programmatically possible. The analysis of these alternatives covers the range of impacts of the other alternatives considered. NEPA requires that all reasonable, representative outcomes are evaluated and presented to describe and clarify basic underlying issues and impacts to provide the decisionmaker with a clear means to discriminate between

the various biological, sociocultural, economic, and physical environmental consequences of the alternatives.

The Notice of Intent for this EIS identified four proposed alternatives. As a result of public scoping, seven more alternatives were added. All 11 alternatives were evaluated to determine whether they could satisfactorily address the program's congressional mandate; whether they were programmatic in nature; whether they proposed service-oriented programs as opposed to regulatory programs; and whether they were legally, socially, environmentally, and politically acceptable to APHIS as well as economically feasible. In other words, this analysis identified reasonable alternatives to the proposed action. Some of the alternatives were not presented in detail because their impacts are likely to be the same as the three alternatives presented in detail.

As a response to comments on the SEIS, two additional alternatives were added to the EIS. While recognized as subsets of the "Current" Program Alternative, the two additional alternatives are treated separately for analysis. The additional alternatives are: (1) a "Nonlethal Control Program Alternative," in which APHIS ADC will not recommend or implement any actions lethal to wildlife; and 2) a "Nonlethal Before Lethal Control Program Alternative", which *requires* APHIS ADC to use nonlethal method(s) prior to APHIS ADC recommending or implementing lethal control actions. These alternatives are presented in detail in Chapter 2 and analyzed in Chapter 4.

Purpose and need have been more clearly defined and distinguished in Chapter 1 of the EIS. The alternatives were developed as alternatives to the APHIS ADC program's mission, not as alternative technological methods or program operations. The EIS provides analysis of the "No Action Alternative," which describes likely outcomes in the absence of an APHIS ADC program. The description of this alternative in Chapter 2 assumes that other agencies or individuals would provide wildlife damage management, as required. Comparison of the five alternatives also assumes a total expenditure of approximately $25 million, based on the APHIS ADC Federally-appropriated budget for FY 1988. Budget priorities of the APHIS ADC program can be determined from inspection of agency expenditures provided in the Economic Impact Assessment in Chapter 4. Because APHIS ADC responds to requests for assistance, the number and types of such requests establish agency priorities. Detailed budget information and priorities for the no action and compensation alternatives are beyond the scope of the EIS, because it is not possible to identify in detail the agencies, persons, or procedures that would be implemented under these alternatives. Comparison of the alternatives does not require a cost-benefit analysis (40 CFR 1502.23), but the EIS does provide sufficient information and analysis to identify the primary benefits and drawbacks associated with each alternative. Commentors should refer to the response to Comment 23 for a more complete discussion of this issue.

The EIS does not assume the superiority of lethal methods. Chapter 2 provides a listing of methods used or recommended by APHIS ADC personnel; many of these are "nonlethal." APHIS ADC personnel give preference to appropriate, practical nonlethal methods in their recommendations (see the discussion of the APHIS ADC decision model in Chapter 2). In recommending or using specific methods, APHIS ADC personnel consider a range of factors that could affect the potential outcome. APHIS ADC procedures do not presume that there are "good" and "bad" animals. As a service agency, it responds to requests.

In requesting analyses of "nonlethal alternatives," many of the commentors appeared to confuse the distinction between methods of control and alternative ways of accomplishing the program. The "nonlethal alternatives" proposed for analysis appear to be either preferences for a specific method or for specific kinds of organizational arrangements. Implementation of IPM includes the use of nonlethal methods as appropriate. APHIS ADC regularly recommends such nonlethal methods through its technical assistance activities. The "nonlethal alternative" that is analyzed requires that only nonlethal methods be implemented or recommended. Constraints on flexibility and effectiveness imposed by application of the

"nonlethal alternative" on a nationwide scale reduces the ability of a program to address the full range of wildlife damage problems.

The compensation program alternative, as indicated by the Economic Impact Assessment in Chapter 4, would be more costly if parity compensation is provided and would probably lead to increased administrative costs. A Damage Compensation Program Alternative would not be able to provide reimbursement for wildlife damage in urban areas or threats to public health and safety. Additionally, compensation programs do not reduce damage, but pay for some or all of the damage that has already occurred.

The comment implies that alternatives resulting in different organizational arrangements should have been analyzed in more detail. The focus of an EIS is on potential impacts. The discussion of alternatives in Chapter 2 notes that many of the alternatives would be anticipated to have similar impacts, even though they do represent different organizational configurations. This discussion is summarized in Table 2-2. The conclusion derived from the analysis is that the potential environmental impacts anticipated to result from any of the alternatives not presented in detail would not be greater than or sufficiently different from the alternatives analyzed in the EIS. Alternatives not presented in detail remain available for implementation by APHIS.

Organized wildlife damage management programs can provide advice regarding proper pesticide use. The APHIS ADC program provides such advice. The EIS does not imply that States without cooperative APHIS ADC programs do not provide such advice, as stated in the comment. Table 2-2 indicates that under the No Action Alternative other Federal or State agencies could assume greater responsibilities for wildlife damage management. The EIS does not attempt to identify in detail what actions States or other agencies might take under the No Action alternative. Table 4-42, which summarizes the impacts assessed in Chapter 4, indicates that there is a potential for adverse impacts from increased individual efforts to control wildlife damage. In other words, the No Action Alternative assumes that without the activities of other agencies (such as State agencies), private efforts to control wildlife damage would increase. Based on historical patterns, one aspect of this increase could be inappropriate use of pesticides.

The comments regarding the need for an alternative that provides for a potential role for the Extension Service in addressing wildlife damage management problems overlook the alternative, "Conversion of Direct Control to Education and Technical Assistance with Transfer of All Funds and Responsibility to the USDA Extension Service," in Chapter 2. In the discussion of this alternative, the EIS notes (p. 2-10) the impacts of this alternative. The details of the organizational arrangements under which this alternative would be implemented are not discussed in the document. Although this alternative was not discussed in detail, it remains a viable decision option for APHIS.

The draft EIS and this Supplement were produced under contract in an unbiased manner and reviewed by an interdisciplinary, professional, technical review group. The professional credentials, disciplines, and experience of those who produced this EIS are found in Appendix D, List of Preparers. The assessment of impacts was based on well-documented evidence. APHIS ADC decisionmakers continue to make informed and unbiased decisions based on the best available information.

COMMENT 5: APHIS ADC did not adequately address NEPA requirements, process, and procedures, including distribution of the DEIS and SEIS, length of comment period, number and location of public hearings on the DEIS, and the lack of hearings on the SEIS.

The comment periods were too short and should have been extended so that additional time could be expended to review and comment on the DEIS and the SEIS. There was a deliberate intent to limit the debate about the program.

APHIS should hold additional public hearings. Three public hearings in three cities is not enough to accommodate all those who wanted to speak. The APHIS ADC program has been shielded from public view. Fewer than 1,000 taxpayers have seen the DEIS. Little effort was made to familiarize the average citizen with the program or to include the average citizen in the review process.

The distribution list should be revised to include every formally organized agricultural producer group in the United States that receives APHIS ADC assistance, because some groups were inadvertently omitted. All well-known wildlife specialists who have written or testified about APHIS ADC should have been included on the list.

APHIS ADC does not have the objectivity to write an EIS about its own actions. An independent, objective group of experts in ecology, biology, and economics should examine APHIS ADC activities. APHIS has failed to use an interdisciplinary approach to ensure the integrated use of the natural and social sciences and the environmental design arts in planning and in decisionmaking.

The DEIS or SEIS do not comply with NEPA requirements because:

- The documents did not properly address the impacts of APHIS ADC's actions on biological resources, but instead explained what actions are carried out by various wildlife agencies.
- In the DEIS the agency failed to analyze all of the hazards of the ongoing APHIS ADC program and failed to evaluate the intensity of alternative impacts on the human environment.
- The DEIS did not provide an analysis of the program impacts to public health and safety; a discussion of unique characteristics of geographic areas; an analysis of the degree to which the impacts could be controversial; an analysis of highly uncertain, unique, or unknown risks; an analysis of the degree to which the program will set a precedent for future programs; an analysis of the impacts to sensitive districts, sites, structures, or historic resources; an analysis of impacts to endangered species and their critical habitats; or a discussion of potential violations of Federal, State, and local law.
- In the DEIS the description of the environment affected by the proposed action is inadequate to provide an analytic base for comparison.
- The DEIS did not implement procedures to make the NEPA process more useful to decision makers and the public, and it did not integrate the requirements of NEPA with other planning and environmental review procedures required by law or by agency practices so that all procedures run concurrently.
- The DEIS and SEIS did not adequately compare the differences in the 11 proposed alternatives so that the risks to the environment could be observed and risk-benefit analyses performed so that the reader could compare and evaluate all of the alternatives. (APHIS used the same preferred alternative from the ADC EIS of 1979.)
- The DEIS did not address the combined effects of the APHIS ADC program. The DEIS divided the program into multiple actions, each of which may be of a relatively insignificant impact, but collectively have a substantial impact (the research activities and congressionally mandated research grants and activities, including the Pocatello Supply Depot, do not have independent utility of their own and, therefore, should be included in the EIS so that the combined effects are adequately addressed).

APHIS's legislative mandate does not permit them to continue operation of the APHIS ADC program in violation of NEPA and does not preclude APHIS from developing alternatives to the current APHIS ADC program. The Secretary of Agriculture should investigate the possible violation of NEPA.

RESPONSE: Preparation of the DEIS and SEIS complied with requirements of the National Environmental Policy Act and the CEQ Implementing Regulations (40 CFR 1500-1508). The Notice of Intent was published in the Federal Register on November 16, 1987. Scoping meetings and comment meetings on the DEIS each were held in three cities: Sacramento, CA; Kansas City, MO; and Washington, DC. Three meetings in three different cities distributed across the United States were considered to be reasonable. The amount of time allotted to each speaker was more than adequate for the majority of speakers. However, all speakers were informed that written comments would be accepted. Verbal and written comments were considered equally in preparing the EIS. Regarding the distribution of the DEIS, the document was provided to parties known to be interested in the program, was available for review at various locations throughout the United States, and was provided to anyone who requested a copy. During the official comment period, APHIS received 1,402 letters commenting on the DEIS. The DEIS has been reviewed by CEQ, EPA, and other Federal and State organizations knowledgeable about NEPA requirements, process, and procedures.

The SEIS was distributed to all commentors on the DEIS plus all individuals and agencies who had requested copies. In addition, the availability of the document was announced in the Federal Register. 89 comment letters were received during the 96 day comment period that extended from January 13, 1993, until April 28, 1993.

Commentors have raised many specific issues associated with the substance and findings of the DEIS and SEIS as well as with the NEPA process. Impacts to biological resources are addressed in the "Biological Impact Assessment" in Chapter 4. The methodology for assessing biological impacts focuses on the impacts of APHIS ADC activities on wildlife species abundance and diversity.

APHIS has conducted an assessment of risks of ADC activities to human health and the environment. The findings are presented in Appendix P.

The risk assessment discusses the degree of uncertainty involved in findings. Potential impacts to threatened and endangered species are addressed by the risk assessment and the USFWS Biological Opinion, and the major findings are summarized in the "Impacts to Threatened and Endangered Species" section in Chapter 4 and the discussion of mitigation in Chapter 5. The EIS describes the major components of the affected environment in Chapter 3.

It is not clear what the comment means by "inadequate to provide an analytic base for comparison." This EIS is not a site-specific document, but rather is a programmatic analysis. Therefore, to address the "unique characteristics of geographic areas" would not be appropriate. However, any future site-specific analysis would address this level of site specificity. APHIS's plans for future NEPA documentation are discussed in Chapter 1.

APHIS has implemented many procedures throughout the program to make the NEPA process more useful to decision makers. Such procedures include the development of a Strategic Plan, the development of APHIS ADC Directives, and the development of monitoring plans (see Chapter 5), among others. The list of preparers indicates the breadth of disciplines used for the interdisciplinary approach (see Appendix D).

The number of proposed alternatives have been expanded from 11 to 13. The five alternatives analyzed and presented in detail in the EIS were chosen because they represent the broadest range of reasonable program alternatives and appropriately respond to public comments on the SEIS. Chapter 4 (see the Summary at the end of the chapter) notes that because no significant adverse impacts are anticipated from the five alternatives analyzed, no significant adverse impacts would be expected from the alternatives not presented in detail. The comment appears to be mistaken regarding the combined effects of the program. Chapter 2 includes APHIS ADC research activities and the Pocatello Supply Depot operations in the description of the current program.

It is true that APHIS's legislative mandate does not supersede NEPA. However, APHIS does not believe that its activities are in violation of NEPA. Chapter 1 identifies the relevant and applicable statutes and regulatory requirements with which the program complies. Dissatisfaction with the program is not the same as a violation of NEPA. The Congress has revisited and reviewed the 1931 ADC Act several times since its passage. (See response to comment 32.)

COMMENT 6: APHIS should revise the EIS to include data for more years than FY 1988.

Up-to-date, comprehensive data concerning damage to crops and livestock from wildlife are lacking throughout the DEIS. USDA's 1986-89 data should be included so that a more accurate picture of the program will be presented. The figures in the document from FY 1988 should be clarified to explain the current changes in the program.

RESPONSE: The APHIS ADC program is an ongoing program that implements Integrated Pest Management on a nationwide basis. The program is broad in coverage and responsive to wildlife damage problems that occur in diverse urban and rural habitats. Program activities change in response to changing needs. The rationale for selecting a snapshot year was that it is reflective of the wide range of damages for any year and reflective of the annual range of APHIS ADC activities implemented to manage wildlife damage, resources protected, and environments affected on a programmatic basis. The data collected for the SEIS were, therefore, focused on FY 1988 to the extent practical.

The comment requests that additional data concerning wildlife damage and program activities be provided. Data from national surveys of agricultural loss due to wildlife damage conducted by the National Agricultural Statistics Service (NASS 1989, 1991, 1992) have become available since the DEIS was written and have been included in the Economic Impact Assessment in Chapter 4 of the EIS and in Appendix M. These surveys indicate that wildlife damage is much more extensive and widespread than documented by studies discussed in the DEIS. Results of an analysis of NASS data by APHIS also are presented in the Economic Impact Assessment in Chapter 4. This Economic Impact Assessment also provides a comparison of resources protected for the years 1988 - 1992. The transfer of the Denver Wildlife Research Center to ADC from APHIS Science and Technology is noted in Chapter 2. Updated information regarding the program's use of chemicals has also been included in Appendix P. The focus of impact assessment remains on the snapshot year of FY 1988, however, the other data have been reviewed, considered, and presented.

COMMENT 7: The DEIS and SEIS did not give adequate consideration to cumulative impacts.

The DEIS and SEIS did not fully address the cumulative impacts of the current program. The DEIS and SEIS establish a record that APHIS ADC activities will have cumulative significant adverse impacts. APHIS ADC programs may have cumulative impacts on affected species. The manner in which biological impacts are rated did not take into account cumulative impacts. The significance of a potential impact should include the cumulative impact. The DEIS "summarily" dealt with the "damage done to certain animal populations" by APHIS ADC activities. Since most states do not have accurate population statistics for species targeted by APHIS ADC, it is difficult to estimate cumulative impacts. The analysis of impacts (p. 4-97 of the DEIS) counted only APHIS ADC kills and reported fur harvests, ignoring other sources of mortality, such as illegal kills, road kills, technical assistance, private kills including nontarget species, and incidental kills. Local and State impacts, which have potential synergistic effects, were ignored.

The No Action Alternative may lead to cumulative impacts through the increase in the actions implemented by individuals.

Cumulative impacts of the Current Program Alternative that should be analyzed in the EIS include:

- Cumulative impacts of APHIS ADC's lethal methods on wildlife populations.
- The use of toxicants without knowledge of long-term impacts. Toxicants can cumulatively impact the quality of surface water, ground water, the ozone layer, and higher levels of the food chain.
- Local cumulative impacts.
- All impacts on all species in all locations of APHIS ADC activities.
- Impacts to threatened and endangered species, such as the ocelot and jaguarundi.
- APHIS ADC coyote programs may result in an increase in rodents, requiring the application of additional control programs.
- APHIS ADC program services, in conjunction with other government subsidies, encourage rancher/farmer dependency.
- Disruption of the delicate balance of natural population control.
- Conversion of wilderness areas to grazing areas.
- Impacts of increased grazing on existing land degradation, including erosion, overuse, and pollution of surface waters.
- The impact of APHIS ADC activities on the western economy.

RESPONSE: CEQ regulations (40 CFR 1508.25) identify the scope of impact assessment to include direct, indirect, and cumulative impacts. In the EIS, assessment of direct and indirect impacts is handled through the impact ratings in the biological assessment in Chapter 4. As noted in the response to Comments 15 and 18, the basic logic of the impact assessment was to focus on 17 target species associated with most of the wildlife damage reported to APHIS ADC and to use the best available documentation or evidence of population magnitudes and trends. The purpose of the resulting impact ratings was to assess the potential environmental impacts of APHIS ADC activities during a representative "snapshot" year. Overall, this analysis concluded that no significant adverse programmatic impacts to wildlife populations are likely to occur; however, the potential for adverse impacts to local populations does exist.

Cumulative impacts of the five program alternatives are addressed in a specific section of Chapter 4. The EIS addresses potential cumulative impacts which could result from any of the five program alternatives. The analyses included in the EIS establish that significant adverse cumulative impacts of a programmatic nature are not likely to occur as a result of APHIS ADC activities. The other mortality factors mentioned in the comment (see p. 4-97 of the DEIS) are addressed. Similarly, the potential for cumulative impacts resulting from use of toxicants is addressed in the cumulative impacts section of Chapter 4 and in Appendix P. The EIS indicates that local cumulative impacts could occur (see the Summary). As a programmatic document, this EIS does not attempt to address impacts at all levels, including State and local levels, nor does it attempt to consider all impacts on all species in all locations, except in a generic way. To consider such potential impacts on a site-specific basis is beyond the scope of a programmatic EIS. With regard to cumulative impacts to threatened and endangered species, commentors are referred to Comment 8, which discusses the findings of the risk assessment (Appendix P) and the USFWS Biological Opinion (Appendix F).

The analysis of cumulative impacts of the No Action Alternative cites the actions of individuals, particularly regarding use of pesticides, as a potential source of cumulative impacts.

Not all of the potential effects identified in the comment are "cumulative impacts." The concept of cumulative impacts contained in the CEQ regulations is a complex one. Cumulative impacts are impacts on the environment that result "from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions (40 CFR 1508.7)." Using this definition, several of the commentors' proposed cumulative impacts are not analyzed in this document as cumulative impacts because they are not incremental impacts of the IPM approach nationwide or are not impacts added to past, present, or reasonably foreseeable future actions.

Proposals to evaluate the impacts on rodent populations resulting from coyote control, or the impacts on predators other than the target species, are not evaluated as cumulative impacts. These effects, if they exist, may be indirect impacts, but they do not appear to have a cumulative character. The analysis of biological impacts in Chapter 4 concludes that nontarget species are not adversely impacted by APHIS ADC activities.

The comment proposes that the APHIS ADC program contributes, by providing for increased grazing, to erosion of land and pollution of surface waters. However, because increasing grazing is not a purpose of implementation of the IPM approach on a nationwide basis, evaluation of this potential effect is beyond the scope of this EIS. Similarly, it was proposed that APHIS ADC, in conjunction with other agricultural subsidy programs, increases the financial dependence of farmers and ranchers on federal subsidies. Providing a "subsidy," however, is not the proposed action being evaluated in this EIS. Moreover, many of the individuals who receive APHIS ADC services contribute cooperative funds or implement activities recommended as technical assistance. These facts suggest that those receiving APHIS ADC assistance do not become dependent, but cooperate in ways provided by the program.

The suggestion that the program disrupts the "delicate balance of population control" appears to be a variation of a more general proposal, namely that "killing predators upsets the balance of nature." Stated as such, this proposed cumulative impact does not identify specific effects that may occur and that could be evaluated. Commentors should refer to Comment 16. Finally, the potential threat of the current program to the economy of the West appears to be somewhat speculative. The total size of the APHIS ADC program in comparison to the recreational economy of the United States is small. As the Economic Impact Assessment in Chapter 4 indicates, APHIS ADC's wildlife damage control activities remove some wildlife species associated with the recreational economy while protecting other species.

COMMENT 8: The DEIS did not adequately consider threatened and endangered species. The USFWS Section 7 Biological Opinion must be in the EIS or the opinion must be available for public review and comment.

The DEIS and SEIS should have presented the results of USFWS Section 7 Biological Opinion. APHIS ADC cannot conclude that the current program imposes no adverse impacts on threatened and endangered species without reference to the findings of this document. The USFWS Biological Opinion should be included in the EIS.

The APHIS ADC program is responsible for the "slaughter of approximately 122 endangered species and 22 endangered plants." Claims that endangered species are aided by APHIS ADC activities are unfounded. One does not protect an endangered species by killing others in its ecosystem. "I'm disgusted by the attempt to use the plight of these species as an excuse to go out and kill some more coyotes." The program's "taking" methods are likely to affect many endangered species and their critical habitats. Although the DEIS states that ADC complies with the Endangered Species Act, APHIS failed to follow completely the procedures mandated by the Act.

With regard to the DEIS Summary (p. 7), the statement that current APHIS ADC programs have no significant adverse impacts on threatened and endangered species at the national level should be revised, clarified, or deleted. The Section 7 Consultation presumes that some APHIS ADC actions may adversely impact certain species. In many cases the loss of a single individual or a few individuals could significantly impact a species at any level. The DEIS Summary (p. 10) should also note that the unavoidable adverse impacts of the Current Program Alternative should include possible loss of threatened and endangered species.

Threatened and endangered species should be protected for recovery and re-introduction into appropriate habitats. Recovery of the grizzly bear and gray wolf in Montana will depend on designing appropriate recovery areas. The EIS should describe APHIS ADC's authority to control threatened and endangered species. APHIS ADC should develop specific procedures to minimize impacts on Category 1 and Category 2 candidate species. APHIS ADC should await the outcome of a pending Endangered Species Act delisting petition regarding the gray wolf before formulating a policy on gray wolves.

The references for the information that coyotes are preying on ocelots and jaguarundis in Texas should be provided.

RESPONSE: The Biological Opinion, inadvertently omitted from the SEIS, was sent to all who received the SEIS and is presented in Appendix F of the final EIS. APHIS ADC complies fully with the Endangered Species Act. APHIS ADC reinitiated a Section 7 consultation with USFWS in connection with this programmatic EIS. The Section 7 Consultation does not presume that adverse effects may occur; its purpose is to arrive at a determination of whether such adverse effects may occur. APHIS ADC prepared its "may affect" determinations that identified how APHIS ADC activities could potentially affect Federally listed threatened and endangered species and included these in Appendix F of the DEIS and SEIS. When the DEIS was issued, the USFWS Biological Opinion was not available. As stated above, the Biological Opinion is included in Appendix F of the EIS.

Although there is a high level of public concern regarding the possible effects of APHIS ADC activities, the Biological Opinion does not indicate that such concern is warranted. USFWS has identified several species that may be affected by APHIS ADC activities, unless such activities are mitigated. Eight species were designated as "jeopardy" species. The designation, used by USFWS, indicates that a species may be jeopardized by an agency's activities if those activities are not mitigated in any way. Similarly, the Biological Opinion indicated that APHIS ADC activities, if not mitigated, could have adverse effects on several other species. The Biological Opinion also identified "reasonable and prudent alternatives" and "reasonable and prudent measures" that, if implemented, would assure that APHIS ADC activities do not pose a risk to any of the species mentioned in the Biological Opinion. By complying with these reasonable and prudent alternatives and measures, APHIS ADC will ensure that its activities do not have significant adverse impacts on threatened or endangered species. Accordingly, revisions to the Summary proposed by the comment are not warranted.

The allegation of APHIS ADC being responsible for the slaughter of approximately 122 endangered species and 22 endangered plants is unwarranted. APHIS ADC complies with the Endangered Species Act and has conducted numerous consultations with USFWS as required under the ESA. Because commentors did not identify the endangered species that are alleged to have been "slaughtered," APHIS ADC cannot respond to this statement in specific terms.

With regard to efforts to reintroduce some endangered species into appropriate habitats, APHIS ADC's authority is described in the agency Directive regarding threatened and endangered species. In some instances where threatened and endangered species are responsible for wildlife damage or when such species require protection by APHIS ADC, the agency will work with the appropriate Federal and State agencies to find acceptable solutions. In some instances, it may be anticipated that wildlife damage will occur, and that efforts to

control such damage will be required. The overall goal of such efforts is to assist in the reintroduction project.

The examples of coyotes preying on ocelots and jaguarundis were intended as illustrative of the potential beneficial impacts of APHIS ADC activities on threatened and endangered species. The USFWS's (1990) Listed Cats of Texas and Arizona Recovery Plan (With Emphasis on Ocelot) notes that coyotes are potential predators of ocelots, with young ocelots presumably more vulnerable than adults. Further, while there is not a high level of interaction between the two species because of their preferences for different habitats, there is a potential for competition along the margins of dense growth areas. Therefore, the potential for coyote predation on ocelots exists. The language has been changed to provide a more accurate description of the circumstances.

COMMENT 9: Mitigation measures proposed are inadequate.

The DEIS has inadequately discussed potential impacts, appropriate mitigation measures, and the best management practices that must be enforced to avoid or minimize impacts. When an agency decides to implement a proposed action it must state whether it has adopted all practical means to avoid or minimize impacts. APHIS must include mitigation in its permits, grants, research, and other activities. NEPA requires mitigation measures to be subject to public comment. Descriptions of mitigation measures must be provided, and such measures must be evaluated to determine how they will mitigate potential impacts. Conclusory statements must be avoided. The three types of mitigation measures identified in the DEIS cannot be analyzed by the public because the DEIS does not identify the impacts they are intended to mitigate. The DEIS does not identify implementation techniques, nor does it analyze the effect of mitigation measures on the human environment as required by 40 CFR 1508.27. APHIS's mitigation plans cannot be used to establish the environmental superiority of a preferred alternative. APHIS's current measures will not compensate for lost human environmental values, even if successful. The suggestion in the DEIS that APHIS ADC should change its name was mere public relations, an "insult to the NEPA process."
A change of purpose, not a change of name, is required.

Specific mitigation measures that should be included in the EIS are:

- Completion of the Management Information System.
- Expanded training on NEPA and other applicable laws and regulations.
- Interpersonnel appointments between APHIS ADC and the Forest Service.
- Presentation in the EIS summary of the number of times nonlethal methods are tried before lethal methods are used.
- Alternative programs for ranchers to reduce wildlife damage, with evaluation of results.
- More attention to wildlife damage prevention, especially if IPM is implemented.
- A study to determine the economic impact of prairie dogs on ranch land.
- Phasing out trapping.

The mitigations listed in the SEIS as "potential" should be "required", especially the 24-hour trap check and requiring the use of nonlethal methods prior to lethal methods.

RESPONSE: ADC is a service branch of APHIS, not a regulatory branch, and does not have enforcement powers as suggested by this comment. CEQ regulations (40 CFR 1502.14 (f)) emphasize that "appropriate mitigation measures" not already included within the discussion of the alternatives be included. Many, if not most, mitigation measures that may be implemented by APHIS ADC are site-specific measures and as such are not appropriate for (i.e., beyond the scope of) this programmatic document. Furthermore, the comment mistakenly asserts that NEPA requires an agency's preferred alternative to be more

environmentally benign than other alternatives discussed in a document. However, it is APHIS's opinion based on the analysis in this EIS that the preferred alternative (the Current Program Alternative) is the most environmentally benign of the alternatives. Implementation of the preferred alternative will therefore minimize potential impacts on wildlife, which is a public resource.

Generally, mitigation measures may be proposed to address significant adverse environmental impacts of the proposed action and alternatives analyzed in an EIS. In assessing the potential environmental impacts of implementing the ADC program on a nationwide basis, APHIS has not identified any significant adverse environmental impacts that would occur as a result of the proposed action or alternatives. APHIS did find that potential adverse impacts may occur as a result of more localized or site-specific activities or projects. Because such activities are not within the scope of analysis of a programmatic EIS, they have not been addressed in this EIS. As outlined in Chapter 1, APHIS ADC's procedure for responding to requests for assistance requires APHIS ADC staff to assess the potential environmental impacts of their activities. Where appropriate, measures will be taken to minimize the adverse effects of wildlife damage control activities on a site-specific basis as stated in Chapter 5. Chapter 5 also presents generalized monitoring plans that will be refined to suit each specific situation and implemented on a local level.

The comment proposes a number of specific mitigation measures for inclusion in the EIS. APHIS ADC recognizes the importance of implementing management systems that will ensure compliance with NEPA, and thereby assist in wildlife management. Accordingly, APHIS ADC has appointed NEPA compliance personnel for the Eastern and Western Regions as well as within the Operational Support Staff in Washington, DC. Expansion of the Management Information System, an important agency priority, is proceeding. The EIS presents a detailed description in Chapter 2 of the APHIS ADC Decision Model that shows the process for selecting appropriate control strategies. Often, it is difficult to identify the number of times a particular method has been used in a specific case, because individuals seeking assistance may work with a variety of agencies to address wildlife damage problems. APHIS ADC offers assistance in implementing many different control methods, including those aimed at preventing wildlife damage. Wildlife damage management is accomplished through damage prevention, minimizing damage, or stopping existing damage. Chapter 5 (see especially pages 5-2 and 5-3) describes some of the research undertaken by APHIS ADC to mitigate potential program effects. The proposed study of prairie dogs is not a mitigation. There are currently no plans to phase out trapping; however, mitigation measures to reduce the likelihood of capturing nontarget species are implemented throughout the program. These measures are described in Chapter 5 and in the nonchemical risk assessment in Appendix P.

The 24-hour trap check is implemented where required by law or where the specific situation makes this prudent and adequate funds are available to allow for this mitigation. The mitigation "requiring" nonlethal methods be used prior to using any lethal method is evaluated as a separate alternative.

COMMENT 10: The APHIS ADC program should not be called an Integrated Pest Management (IPM) program.

The DEIS describes the APHIS ADC program as an Integrated Pest Management (IPM) approach to control wildlife. The APHIS ADC definition of IPM is narrow and incorrect. In general, IPM is a preventive, broad-based strategic approach to wildlife damage control, taking into consideration thresholds of damage, quantification of economic loss, biological environment, and the complex interactions of each species with its environment, with an emphasis on the use of natural control methods. The DEIS rarely mentioned nonlethal or preventive methods of wildlife control; the analysis appeared to be focused on lethal control methods. Therefore, APHIS ADC cannot use IPM as a label to legitimize and or justify its own program. To be defined as an IPM program, APHIS ADC should reevaluate its

methods of wildlife damage control, put into practice preventive strategies, and place less emphasis on lethal control methods.

RESPONSE: The use of "Integrated Pest Management (IPM) approach" in describing the APHIS ADC program is legitimate and appropriate. IPM was developed first in entomology; the EIS describes how IPM can be applied to management of vertebrate wildlife damage. The basic principles of IPM and their application to controlling vertebrate pests are described in Chapters 1 and 2 of this EIS. This analysis attempts to clarify how the concept of IPM can be applied to an area not included in the original IPM approach. The decision model outlined in Chapter 2 identifies a number of relevant considerations in determining an appropriate control strategy. These factors include the regulatory framework, economic losses and costs, social acceptability, effectiveness, and others. This model allows for consideration of a broad range of factors in selection of control strategies in an effort to find an acceptable balance between human interests and wildlife needs. Examples of the application of this model are included as Appendix N. This model and the examples represent the current thinking about IPM within the APHIS ADC program. It is expected that the sophistication of the IPM approach will evolve. It is also expected that the use of this model will incorporate methods to respond to changing problems of wildlife damage management and societal values and expectations.

The emphasis on lethal methods in the DEIS referred to in the comment is not related to the validity of the IPM approach used by the APHIS ADC program. An EIS is supposed to focus on impacts that may be significant or controversial. Accordingly, the DEIS devoted more attention to discussion of lethal methods. Because comments such as this one (and Comment 11) requested more information on all methods, the EIS now includes additional material on all methods used by APHIS ADC. Appendix J of the EIS provides a discussion of the methods currently used by the APHIS ADC program. Appendix P provides an assessment of risks associated with these methods. Commentors are also referred to Comment 11.

Because commentors voiced concerns about how APHIS ADC implements the IPM approach on a nationwide basis, the discussion in Chapters 1 and 2 of the EIS clarifies APHIS ADC's Decision Model.

COMMENT 11: The DEIS contains no description or analysis of APHIS ADC's control methods.

The DEIS and SEIS are inadequate because they lack analysis of the effectiveness of control methods used by APHIS ADC. The range of alternatives in the DEIS excluded such an analysis; the current preferred alternative should be revised to include a description of all methods of control included in the Integrated Pest Management approach. Appendix I contains such a description; however, the body of the DEIS lacks a reference to this appendix.

The DEIS did not contain all of the predator control methods that the government has used or has allowed individuals leasing public lands to use. Complete information concerning the type of technical assistance provided is not included. The EIS should include the site-specific control methods and guidelines for the implementation for those methods. The EIS should provide a more detailed discussion of how the impacts resulting from uses of control methods will be minimized.

RESPONSE: A complete description of all methods used by APHIS ADC, along with their patterns of use during 1988, is now included in Chapter 4, the risk assessment (see Appendix P), and the description of APHIS ADC control methods (Appendix J). In addition, Chapter 2 has been expanded to identify the most important control methods and describe the process used by APHIS ADC to select methods for application to specific damage problems. Examples of the decision process have been added in Appendix N. These examples incorporate both direct control and technical assistance actions. These expanded sections are based on information provided by APHIS ADC State offices as well as other program

records and relevant literature. APHIS has attempted to provide complete descriptions of control methods and their use. Environmental impacts, as well as public health and safety issues, are discussed for each control method used by APHIS ADC. Individual methods are seldom used in isolation or independently, but rather as part of integrated strategies or programs. Therefore, APHIS ADC cannot separately evaluate the costs or impacts of each individual method. Literature cited concerning methods development identifies discernable impacts and risks (see Appendices A and P).

Because this EIS is a programmatic document, it assesses the impacts of APHIS ADC activities on a nationwide basis. Detailed analysis of site-specific impacts of control methods is beyond the scope of this document.

COMMENT 12: APHIS ADC control methods are not selective.

The program results in unnecessary "mass slaughter" of such nontarget species as dogs, cats, and threatened and endangered species. More than 20 species of nontarget mammals and birds have been significantly affected by the program. Wildlife not responsible for any agricultural or livestock damage is being destroyed. APHIS ADC should analyze the efficiency and nonselectivity of its methods of predator control so that only the most effective control methodologies will be employed in the future.

Toxicants and traps are nonselective lethal controls that have adverse impacts. The use of traps, snares, and M-44 cyanide ejectors to control coyotes inadvertently kills the greatest number of nontarget species. The use of poisons and traps is indiscriminate and even threatens public health and safety. The use of toxicants (such as strychnine and compound 1080) is damaging to the environment, because they have the potential to contaminate surface waters, ground water, food crops, livestock, fish populations, threatened and endangered species, and the ozone layer. The EIS should address this potential for contamination.

APHIS ADC control efforts should focus on the few offending animals, not whole populations. Current APHIS ADC control methods disrupt the natural populations of nontarget as well as target species, disturb the natural ecology of predator-prey relationships, and cause adverse impacts to the environment. Furthermore, suppression or eradication of whole target species can result in proliferation of other damaging target species. The Leopold Report findings that the practices of APHIS ADC were nonselective support the conclusion that current policies should be changed.

The EIS should adequately address the impacts of the APHIS ADC program on nontarget species. The percentages of nontarget kills relative to total APHIS ADC program kills is much higher than the estimate of 5 percent provided in the DEIS. Studies in Colorado indicate nontarget kills constitute 75 - 90 percent of the total when trapping coyotes. The DEIS also incorrectly claims that only one hawk was killed by the APHIS ADC program. Residents of eastern Washington claim hawk populations have been decimated by APHIS ADC activities. More than 13 percent of the APHIS ADC program kill in New Mexico consisted of nontarget species, many of which may have been State-designated as threatened and endangered species. APHIS ADC should develop a process to assess impacts to local populations of nontarget species and to mitigate these impacts.

RESPONSE: The term "mass slaughter" implies that large numbers of nontarget species are being killed, that APHIS ADC is indiscriminate in its use of control methods, or both. Appendices H and I provide numbers of nontarget species captured and destroyed, based on APHIS ADC records. Analysis of Appendices H and I, as well as the analyses of the risks of APHIS ADC control methods contained in Appendix P, shows the effect of APHIS ADC control methods on nontarget animals. Though individual nontarget animals may be destroyed during damage control operations, this does not directly relate to being harmful to the nontarget species. For example, coyotes removed by APHIS ADC may kill more skunks than were killed by APHIS ADC while targeting the coyotes. The net effect would benefit

the local skunk population despite APHIS ADC destroying some individual skunks. In many cases, animals captured are not destroyed. The APHIS ADC program does capture feral or free-ranging dogs and cats, most of which are target animals.

APHIS ADC shares the concern expressed in the comment that the effectiveness and selectivity of wildlife damage management methods should be analyzed. Use of control methods must reflect a balance of differing perspectives of the public on the need for and acceptable methods of controlling wildlife damage. These methods have been extensively analyzed on a programmatic basis, and the findings are presented in Appendix P. The findings have been used to develop mitigation measures presented in Chapter 5. Commentors are also referred to Comment 14 for a discussion of the potential impacts of pesticides. The results of these investigations, and the mitigation measures that follow from them, will assist APHIS ADC in providing effective wildlife damage management.

In particular cases, the selectivity of a method is a matter important enough to result in the issuance of guidance for the use of the method. APHIS ADC Directives contain examples of such guidance, as does the USFWS Biological Opinion (Appendix F). Both documents, as well as others cited throughout the EIS, recognize the dangers of specific methods for particular species and place restrictions on use to reduce the dangers.

In addition, APHIS ADC conducts research to develop and implement more selective methods and to make existing methods more selective. For example, research on trapping has resulted in the program-wide mandatory use of pan-tension devices when trapping for coyotes, which help to increase the chances that only target species are captured. Such research, some of which is described in this EIS, has led to identifying potential risks of control methods as well as mitigation measures to reduce risks.

There is, inevitably, controversy concerning the numbers of animals and the proportion of given populations that APHIS ADC takes. Much effort has gone into the development of population figures in this EIS, and there is every reason to believe they represent the most accurate estimates possible. There is a potential that APHIS ADC activities may impact local populations. Recognizing this potential, the EIS identifies procedures for identifying and mitigating such impacts.

The APHIS ADC program does not suppress or eradicate any target species throughout its range. APHIS ADC practices have changed greatly since the Leopold Report was published in 1964. Most of the recommendations were implemented.

APHIS ADC is not aware of Colorado studies indicating that nontarget kills constitute 75 to 90 percent of the total when trapping coyotes. Nontarget kills of this magnitude do not occur in today's APHIS ADC program (see Appendices H, I, and P). The DEIS did not claim that only one hawk had been killed by the program. Appendix H lists one hawk killed in Texas and 24 hawks killed in California. APHIS ADC records do not show any hawks killed in Washington. Examination of APHIS ADC records for New Mexico shows that the comment is correct in stating that nontarget kills accounted for more than 13 percent of total kills. APHIS ADC records have been compared with the Amended Listing of Endangered Wildlife of New Mexico (N.M. Department of Game and Fish Regulation No. 682), and the APHIS ADC kills did not include any State-listed species.

COMMENT 13: The DEIS does not take into account cruelty of control methods and wildlife suffering. APHIS ADC should have to obey State humane laws. APHIS ADC methods are cruel and inhumane.

APHIS ADC's wildlife control methods are cruel, inhumane, barbaric, and nonselective. The current program is cruel, senseless, wasteful, immoral, destructive to the environment, and ecologically harmful and does not help agriculture. In Chapter 3, Sociocultural Environment, the APHIS ADC ignores the ethical issues. Cruel and inhumane control methods are uncalled for and unethical.

The priorities and the agenda of APHIS ADC are far out of line with modern knowledge concerning humane and balanced wildlife management. APHIS ADC is cruel for massacring baby coyotes in their dens. The APHIS ADC control method of setting poison bait for live creatures is very inhumane because once the bait is eaten, the animal will have a slow, painful death.

No steel-jawed traps should be used because they are nonselective, cruel, totally barbaric, and stressful. Many of the species caught by these traps die of dehydration or other inhumane effects. The International Standards for Humane Traps should be adopted by APHIS ADC. Traps should be checked every 24 hours by APHIS ADC personnel. APHIS ADC should provide a vivid description of a coyote caught in a leghold trap, which is similar to the description of a coyote preying on a sheep, to give commentors the opportunity to assess the inhumaneness of APHIS ADC treatment of native wildlife. It is inhumane for APHIS ADC to release injured animals after they have been caught in the traps. APHIS ADC should obey State humane laws.

APHIS ADC's position with regard to animal suffering should be clearly explained. The DEIS did not consider animal suffering relevant enough for an in-depth discussion. Nor did the DEIS explore alternative, nonlethal methods of crop or livestock protection.

More stringent requirements should be established and enforced for the monitoring of APHIS ADC control actions to ensure humane treatment. APHIS's Animal Welfare staff should be consulted to address the ethical and moral issues associated with the ADC program.

RESPONSE: APHIS ADC personnel are concerned about animal welfare. APHIS is aware that some ADC activities are controversial, but also believes that these activities are being conducted as humanely and responsibly as practical. Research on the development of improved and humane control methods is continuing, and nonlethal methods are used or recommended by APHIS ADC personnel whenever practical. The APHIS ADC program is not directed at large-scale destruction of wildlife, but rather at responding to requests for direct control and technical assistance in cases where people or communities are experiencing wildlife damage or threats to public health and safety. In responding to such requests, APHIS ADC personnel use and recommend nonlethal control methods when practical (Chapter 2). In doing so, the APHIS ADC program does not characterize particular wildlife species as good or bad, but recognizes that any wildlife species can cause damage and that such damage should be responded to in a professional manner. Regarding the comment about obeying State laws, APHIS ADC is not aware of any instance where State laws have been violated in the implementation of wildlife damage control by APHIS ADC personnel. APHIS ADC Directives, which further govern the implementation of the program, provide direction to field personnel regarding the monitoring of APHIS ADC control methods to assure compliance with Federal and State laws and regulations.

Commentors are also encouraged to refer to Comments 1 and 12 for a discussion of issues related to the concerns expressed in this comment.

COMMENT 14: APHIS ADC's use of chemicals poses a risk to the environment and to public health and safety.

APHIS ADC's use of toxic chemicals, poisons, and pesticides poses a risk to the environment and public health, especially where provided to private individuals as technical assistance. Such private individuals may not be sufficiently knowledgeable about the use and effects of pesticides. Emphasis on an IPM approach should result in a reduction or discontinuation of toxic chemical usage.

APHIS ADC chemical use may result in severe adverse environmental impacts, and the DEIS should have assessed the potential for such impacts to occur. The discussion of pesticides lacks adequate detail; the EIS should include a discussion of the pesticides used in

1989 and 1990 and those that will be used in the future. Warfarin is an example. The manufacturer has decided not to renew the registration, and the EIS should detail what substitute APHIS ADC will use, if any, and how such a change will impact nontarget species. To support the conclusion that the level of potential impact on the physical environment is small, the EIS should include more detailed data on exposure levels of pesticides used. The EIS should include a discussion of the restrictions and safeguards required by pesticide regulations and how APHIS ADC will implement those safeguards. The DEIS does not adequately describe how pesticides are being used or discuss what changes will be made in APHIS ADC policy and procedures to reduce the number of nontarget kills. The EIS should indicate when and why APHIS ADC uses chemicals and when it baits private property, instructions given to cooperators, and training given to or required of Pest Control Operators (PCO) and Cooperators.

The long-term effects of the chemicals listed in Tables K-1 and K-2 are not known with enough certainty to be worth the risk of using them. Even though chemicals may be sprayed at an acceptable level, they can become concentrated in the tissues of plants and animals. This problem often intensifies as chemicals move up the food chain when predators eat prey carrying the toxins. If chemicals must be used, they should be avoided in watershed areas where they could adversely affect riparian wildlife communities or human communities downstream. To protect public health and safety, prior consent of nearby residents should be obtained before spraying or dispersing chemicals in a particular area. The EIS should discuss runoff of chemicals used in the APHIS ADC program into wetlands and include a quantitative assessment of the environmental health risk for compound PA-14.

The EIS should acknowledge that aboveground use of strychnine is presently prohibited by a court injunction. Some of the present product labels may be out of date and therefore may not provide sufficient protection for endangered and threatened species. Agency labels on 4-aminopyridine have not been changed to reflect the USFWS Biological Opinion that it jeopardizes the wood stork. Other labels are also out of date with respect to their impacts to threatened and endangered species. The statement "that because aluminum phosphate, zinc phosphide, sodium cyanide, and sodium nitrate are considered environmentally nonpersistent and have no medium of resistance, they are unlikely to cause significant environmental hazards," should be revised. Such chemicals can have a significant impact on several endangered and threatened species and their food base, including the Utah prairie dog, the black footed ferret and its food supply, and the black tailed prairie dog. The DEIS does not address the potential adverse impacts of chemicals on migratory bird species. The desert tortoise may be adversely impacted if such chemicals as aluminum phosphide, gas cartridges, or sodium cyanide are used to control species that occur in burrows.

The EIS should demonstrate that the use of toxic substances is consistent with the land use plans of the public lands so that there will not be violations of FLPMA, NFMA, or NEPA. The DEIS ignores danger to the public resulting from chemical use on public lands. Nontarget species are killed by APHIS ADC chemicals. For example, on September 10, 1990, five black bears were found poisoned on U.S. Forest Service land near Meeker, CO, from feeding on a sheep carcass laced with poison. In Oak Creek, CO, there are documented cases of compound 1080 poisonings of domestic species within town limits. It is common knowledge that a local sheepherding family has stockpiles of compound 1080. The EIS should include a rigid inventory control if it is going to allow and distribute poison and traps.

Statements in Appendix J, Table J-4, misrepresent the potential hazards of the compound 1080 sheep protection collar. The extent to which secondary exposure is a problem is determined by how much compound 1080 the primary victim ingests and by how much of that animal is eaten by a scavenger. While the likelihood is low that either type of nontarget poisoning would occur with the collar, the potential for a significant impact is always present.

RESPONSE: APHIS ADC personnel are aware of and are concerned about the risks of chemicals used for wildlife damage control. The APHIS ADC program complies with the

Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). Only trained and certified applicators are permitted to apply restricted-use pesticides. When APHIS ADC personnel use pesticides, precautions are taken to assure that these materials are used in ways that pose the least possible risk to the environment and public health and safety. APHIS ADC personnel also recommend equally safe practices to private users through technical assistance activities and instruct those users to abide by applicable regulations and the EPA label instructions required by those regulations.

A substantial amount of additional information on potential risks associated with APHIS ADC use of chemical control methods has been developed since the DEIS was issued and is included in this EIS Chapter 4 and Appendix P). The risk assessment identified no potential for nationwide, adverse environmental risks from the use of chemical control agents, although some potential site-specific effects were identified. This risk assessment included information from the Draft EIS Appendix J regarding the Livestock Protection Collar. Consultation with USFWS has resulted in a Biological Opinion that identifies potential risks to threatened and endangered species from APHIS ADC activities and methods whereby potential risks will be minimized or eliminated (Appendix F). Implementation of the Monitoring Plan (in Chapter 5) will monitor effects of chemicals that may have localized adverse environmental impacts, and the resulting data will allow adjustment of control techniques to further minimize environmental risks.

APHIS ADC program researchers devote much effort to studies of the toxicology and environmental risks associated with chemicals such as those listed in Appendix K. These studies are important in deciding if new chemicals should be registered for pesticidal uses and in modifying chemical use patterns to minimize environmental risks.

Recent communication with the manufacturer of Warfarin indicates that the EPA registration for this pesticide will be maintained (Connolly 1992).

The risks associated with PA-14 are analyzed in Appendix P. They were also addressed in a previous EIS (USDI 1976).

It is beyond the scope of this EIS to address public land policy and associated legislation (e.g., FLPMA, NFMA). However, all APHIS ADC actions on public lands are coordinated with land management agencies to assure that such actions comply with the provisions of FLPMA, NFMA, NEPA, and other applicable laws.

Alleged misuse of toxicants by private individuals is beyond the scope of this document . However, these concerns indicate that the need for professional wildlife damage management will increase. Information concerning violations of State or Federal laws and regulations should be reported to the appropriate regulatory agencies. Potential hazards of the Compound 1080 livestock protection collar have been reanalyzed in the risk assessment of chemical methods (Appendix P). The results confirm previous conclusions that use of LP collar poses little potential for significant adverse impacts.

COMMENT 15: The accuracy of target and nontarget take figures and of population figures is open to question.

The accuracy of the target and nontarget take figures contained in the DEIS is questionable. More detailed information should be included in the EIS regarding APHIS ADC's new Management Information System (MIS) to standardize predation data collection and reporting. The DEIS should have discussed the accuracy of its nontarget species numbers. There is an incentive for its employees to underreport nontarget species.

The DEIS was inconsistent in population estimations of target and nontarget species. No sources are cited and no dates are given for those estimates. Population estimates for bears and mountain lions are extremely unreliable. No population data exist at all for such species as the opossum, porcupine, and prairie dog.

Because only 59 population "estimates" are cited (therefore, 69 percent of the magnitude calculations were done without "estimates"), the validity of the 183 "magnitude" calculations made on the 17 target species is questionable. "Allowable harvest levels," their source, how they are calculated, and why only eight out of 17 are available are not explained.

If "abundance" is defined as the number of individuals in a species population (p. 4-4 of DEIS), then the abundance of those species cannot be calculated. If "magnitude" is defined as a measure of the number of animals killed in relation to their abundance (p. 4-5 of DEIS), then any determinations of magnitude made in such circumstances are baseless and should not be presented in the EIS.

The DEIS ignored many of the problems that were regional or local in nature by lumping total impacts together as one national figure. For example, the DEIS stated that 6,624 nontarget species were killed in 1988, and Appendix H states that 3,706 of those species were killed in Texas (accounting for 55.95 percent of the total nontarget species killed). The DEIS did not discuss this impact and how APHIS ADC is planning to reduce the numbers killed.

Harvest data for Nebraska that are contained in Tables 4-11, 13, 16, 17, 18, 20, and 23 are also questionable. If the totals are only for counties cooperating with the APHIS ADC program, it should be so noted.

Mountain lion "take" data contained in Table 4-22 (Table 4-27 in the FEIS) for the State of Texas are unrealistically low. A kill of 40 does not take into account the number of mountain lions killed by private land owners and the Texas Park and Wildlife Department. The allowable harvest levels for mountain lions contained in the DEIS are inflated. Killing 30 percent of the mountain lion population is unacceptable, given the lion's low population levels.

Table 4-1 assumes Statewide estimates of populations and harvest levels for species controlled by APHIS ADC; there is no explanation of how the accuracy of the data were validated.

RESPONSE: This EIS included a more exhaustive effort than has ever been made before to compile all available information and to evaluate it in terms of its relevance to this impact assessment. The best available information has been used. APHIS ADC data on target and nontarget animals taken are as accurate as possible.

An important point concerning "take" figures is that some commentors seem to confuse the APHIS ADC take with that of private individuals and other agencies. This EIS must evaluate the impacts of the APHIS ADC program and its alternatives, not the direct impacts of every action undertaken by others that affects wildlife. However, the take by others has been considered in evaluating potential cumulative effects. This is the context in which others' estimates of "allowable" take were used.

Some of the basic logic of the analysis may help to address concerns over accuracy of the various numbers. Key criteria for selection of the 17 species and species groups for detailed evaluation were listed on pages 3-21 of the DEIS. These criteria ensure that the selected species are those for which the most information is available relative to the APHIS ADC program. Because the 17 species are those that were killed in the greatest numbers, they were the best candidates to determine the effect of APHIS ADC activities on species abundance and diversity. The DEIS evaluation searched for evidence of impacts on nontarget species. Among target species, only localized effects on populations were identified. The same was true for nontarget species. The DEIS did not ignore problems that are local or regional in nature; rather, it viewed detailed analysis of these problems as outside the scope of a programmatic EIS. The EIS acknowledges that such local or regional impacts may occur and in Chapter 5 indicates monitoring and mitigation measures to ensure that such impacts will be addressed. Site specific documentation will address local impacts.

The Evaluation Approach and Evaluation Factors sections (see pages 4-10, 4-11) describe more fully the approach used to arrive at the impact ratings described in Table 4-1. The evaluation includes qualitative and quantitative components. Where population and harvest estimates and APHIS ADC kill statistics were available, quantitative determinations were made. Where such estimates were not available, qualitative determinations were made. The qualitative determinations relied on estimates of population trends and harvests as well as on APHIS ADC data. Information on total population estimates and population trends was -obtained from State wildlife management agencies as well as from other sources. These sources are footnoted in the tables.

"Abundance" does not refer to a count of individuals composing wildlife populations. The discussion of the Evaluation Approach and Evaluation Factors acknowledges that estimates of the total numbers are used. The objective of the comparison of abundance with magnitude is to arrive at an estimated proportion of the populations taken by APHIS ADC.

Harvest data for Nebraska were obtained from the State wildlife agency and do not indicate whether they refer only to counties cooperating with APHIS ADC. The data were not compiled independently by APHIS ADC. Table 4-27 indicates that the total mountain lion take in Texas is not known. No records are kept because the mountain lion is not a protected species in the State.

COMMENT 16: APHIS ADC practices are not biologically or environmentally sound, and they contribute to upsetting the balance of nature.

Improper management of wildlife populations leads to a predator-prey imbalance, upsetting natural equilibrium. Nature, without human interference, has established a delicate balance for species population control. Uncontrolled elimination of large numbers of animals would disrupt the natural ecological balance and result in negative impacts to the environment. Some species could be drastically reduced and possibly eliminated entirely. The DEIS did not consider the important role of the predator-prey interaction in nature. Predators should not be singled out for destruction just because their existence conflicts with the economic interests of man. It is a human responsibility to maintain the normal ecological balance. We cannot continue to criticize Third-World nations for not protecting their environments and biodiversity while failing to do so ourselves.

APHIS ADC practices reduce biological diversity and put the food chain at risk. APHIS ADC practices are not based on scientific knowledge of predators, and the environmental and population dynamics of specific areas are not well enough known to assess the impacts of APHIS ADC activities. Removing "pest" species does not offer a long-term solution because other predators move in. APHIS ADC does not effectively monitor target populations. The APHIS ADC program is illogical because it conflicts with other efforts to restore wildlife, such as the Pittman-Robertson Act.

Deer and rodents are examples of species that interfere with farming and whose natural predators (coyotes and birds of prey) are being reduced in number. This leads to a drastic escalation in populations of deer and rodents. Another example is the APHIS ADC "prairie dog shoot" in Nucla and Naturita, CO, conducted to reduce prairie dog populations. These populations had grown as a result of APHIS ADC's effectiveness in killing the natural enemies of the prairie dog.

The taking of adult predators often alters the behaviors of juvenile predators. As an example, young mountain lions who are inadequately developed to hunt their traditional prey (e.g., deer) often turn to increased consumption of domesticated species, which are easier to kill. Proliferation of "nuisance" species, such as starlings and blackbirds, occurs as their natural avian predators are removed.

Killing black bears is nonsensical, as no one knows how many are left. The numbers provided by the Colorado Division of Wildlife are only for reported kills, when in fact at least

as many are poached yearly. There is no good reason to kill bears, coyotes, and cougars when populations are estimated and the destruction and fragmentation of habitat are primary reasons for concern of the viability of large mammal and bird species. Killing large numbers of coyotes is not an effective means to manage livestock depredation. One study (Connolly and Longhurst, 1975) showed that coyotes increase reproduction rate and litter size in response to hunting pressure.

RESPONSE: "Natural" systems are in a state of dynamic equilibrium. Balance is not static. Some species are increasing in numbers, while others are decreasing. Such changes are constantly occurring. Human populations are an integral component of this balance. Humans impact wildlife through activities such as crop and livestock production, urban development, and recreation. Similarly, wildlife activities impact human populations. The presence of humans and their activities can impose an element of management simply because of competition for resources and because of the changes humans cause in the landscape. Sound management practices take into account the dynamic state of the "balance of nature," the often diverse interests of humans, wildlife needs, and the conflicts that sometimes result. Human influences on all ecosystems are present regardless of APHIS ADC activities.

The APHIS ADC program (Chapter 1) attempts to minimize conflicts between humans and wildlife. APHIS ADC seeks to accomplish this mandate under law based on biological research and knowledge. Control of wildlife populations or removal of individual animals is a scientifically recognized component of wildlife management, as are preservation and the maintenance of populations (see Chapter 1, pp. 3-5). APHIS ADC practices are based on scientific knowledge of wildlife populations and habitats. For example, the Denver Wildlife Research Center conducts research regarding the behavior of predators, the effectiveness of wildlife damage control methods, and many other topics related to the control of wildlife damage. This research is one basis for APHIS ADC approaches to the control of wildlife damage. In Chapter 2 of the EIS, APHIS ADC's decision model for selecting strategies for wildlife damage management identifies several factors, including anticipation of potential impacts, that demonstrate the scientific and professional basis of APHIS ADC activities. As noted in the risk assessment for APHIS ADC control methods (Appendix P), the small amounts of chemicals used by APHIS ADC do not pose unmanageable risks.

The IPM approach described in this EIS does not include widespread destruction or elimination of any wildlife species. This EIS has concluded that the APHIS ADC program does not result in significant adverse impacts to wildlife on a national basis (Chapter 4). Moreover, the USFWS Biological Opinion (see Appendix F) indicates that APHIS ADC practices will not jeopardize threatened and endangered species, provided that the reasonable and prudent alternatives outlined in the Biological Opinion are adopted for eight species (see Chapter 5 for a discussion of these measures).

APHIS ADC take for the 17 target species evaluated in this EIS is small in proportion to the total known take. These numbers are based on an attempt to obtain the best available data (see Comment 15). For example, APHIS ADC killed 291 black bears nationwide in 1988, while the total known take was 7,399. APHIS ADC activities with regard to black bears were, like all APHIS ADC activities, undertaken in response to a request for assistance, and only after a determination that the black bear was responsible for damage, that practical nonlethal methods were not available, and that APHIS ADC activities would not negatively impact the species. In FY 1988, APHIS ADC did not kill any prairie dogs in Colorado. As indicated in Table 4-20, shooting is not frequently used as a method for control of prairie dog populations by the APHIS ADC program. The primary predators on prairie dogs today are avian and mustellid (badgers and weasels), not canid (Koford, 1958), and APHIS ADC does not, and has not, removed significant numbers of avian or mustellid predators from eastern Colorado. The biological impact assessment in Chapter 4 used population estimates from State wildlife management agencies. Wildlife management is based on estimations of wildlife populations. The many successes of modern wildlife management are reflective that

such estimates are conducive to responsible wildlife management. These estimates are the best available data. Analysis included in the SEIS indicated that the populations of large predators specified in the comment are stable or increasing in States where estimates of population trends were available (see Tables 4-24, 4-25, and 4-27). No State reported a population decrease. Connolly and Longhurst (1975) did find that coyotes "recovered to pre-control densities within 3 to 5 years after control was terminated," but this finding does not mean that killing coyotes fails to reduce depredations on livestock. The analysis supports the conclusion that the current level of APHIS ADC activity leads to temporary decreases in local coyote populations.

COMMENT 17: The DEIS should have assessed the impacts of APHIS ADC activities at specific sites and locations or used the ecosystem as the relevant unit of analysis.

The DEIS was conducted on too broad a scale and failed to include the details necessary to understand the full scope and impact of the program. The EIS should explicitly set forth how it may be used as a policy tool for developing assessments of site-specific situations. One document cannot adequately assess all of the environmental impacts of a national program such as APHIS ADC because an assessment of activities in a single State could be contained in a single document of the DEIS's size.

The broad conclusions of the DEIS are not sensitive to conditions in specific parts of the country and do not adequately inform people of the program's impacts. Consolidation of regional impacts into national statistics overlooks the fact that some problems may exist only regionally and downplays a potentially disproportionate impact on nontargets in one area. The DEIS does not adequately address impacts on State or local species diversity and does not include an assessment of the cumulative impacts of State and local wildlife damage control efforts. Consideration of data at the State level and especially at the national level is inappropriate and obscures the recognition of major local impacts. The EIS should conduct its assessment at the "biogeographical" or ecosystem level, using boundaries appropriate to these systems.

RESPONSE: An EIS may address the environmental impacts of proposed legislation, the implementation of a program, or the implementation of specific activities or projects carried out at a site (40 CFR 1508.18). This EIS assesses the potential environmental impacts that could occur as a result of a nationwide program of wildlife damage management. As a programmatic environmental impact statement, this document does not address site-specific activities or projects that will be conducted by APHIS ADC (40 CFR 1500.4(i)). As some of the commentors recognized, addressing all APHIS ADC activities, at all sites, over time would not be possible. CEQ recognizes this difficulty and encourages a tiered methodology to focus on the actual issues ripe for review (40 CFR 1502.20). This EIS focuses on information that is relevant for comparing and contrasting the programmatic alternatives set forth in the EIS. Assessments of all site-specific activities would not assist in the comparison of, for example, the Compensation Program Alternative with the No Action Alternative.

Chapters 4 and 5 of the EIS recognize that there is a potential for localized wildlife populations to be adversely impacted by specific projects conducted by APHIS ADC. Accordingly, APHIS ADC has committed to monitoring its projects to determine and measure the effects of such potential impacts (see Chapter 5). When undertaking specific projects, APHIS ADC will analyze and prepare documentation of potential environmental impacts as required by NEPA.

COMMENT 18: The scope of impacts considered in the DEIS is not correct.

The DEIS did not consider the correct scope of potential impacts in several of the areas covered. It is claimed (on p. 4-1) that impacts will be examined at the community or ecosystem level, but this approach is conspicuous by its absence. Measures of diversity used are not those usually used by ecologists, who would normally consider not only the number of species in an area but also the number of individuals in each species. It is also important to consider the "magnitude, geographic extent, duration, frequency, and likelihood" of impacts on diversity as well as on abundance. Without accurate population numbers, such impacts cannot be determined. The impact assessment does not consider "edge" and "area sensitive species" or spatial scales. Elimination of a local population may be an impact, even though the species remains viable at a national level. It is difficult to believe that no significant impacts will occur, given the total wildlife mortality documented in the DEIS.

The species selected for assessment should represent the existing range of wildlife damage problems, but do not. Omission of deer, wolves, geese, and raccoons raises questions about the criteria by which the species were selected.

RESPONSE: The principal consideration in assessing impacts was to identify those impacts that could result from implementation of the APHIS ADC program alternatives nationwide. From this standpoint—a nationwide, programmatic standpoint—it is unlikely that significant adverse impacts will occur. The EIS also identified the potential for significant adverse impacts to local populations (see the biological impact assessment in Chapter 4 and the summary of potential impacts in Chapter 5); however, a detailed site-specific description or assessment of such impacts is not within the scope of this programmatic document. The measures of diversity and abundance used in the biological impact assessment in Chapter 4 are appropriate for this task. Commentors are also referred to Comments 16 and 17 for discussion of related issues.

The raccoon *was* selected as one of the 17 species evaluated in detail (see Chapter 4, pp. 74-76), contrary to the comment above.

The species selected for analysis do not represent the total range of species that may cause wildlife damage problems. The species analyzed in this document were selected because most APHIS ADC direct control activities focus on damage problems caused by these species. They are therefore the most appropriate indicators of programmatic impacts resulting from APHIS ADC activities. Not all wildlife damage falls within APHIS ADC's legal authority. For example, APHIS ADC does not normally conduct control activities for State-managed game species in most states. APHIS ADC does not address all wildlife damage problems in the United States, and this EIS does not attempt to evaluate every damage problem. Finally, APHIS ADC is a service organization. It is mandated to respond to requests for assistance. Without such a request, APHIS ADC does not act independently to manage existing or potential wildlife damage.

COMMENT 19: The Draft EIS ignores public land issues that are the real problem with the APHIS ADC program.

Public lands are governed by a principle of multiple use and should be available for a variety of users. It is possible to manage public lands according to the multiple-use concept, but this concept is not being implemented. Grazing or other "consumptive" uses have become a priority, to the detriment of the land and the wildlife. APHIS ADC activities encourage or contribute to degradation, either by making grazing possible or by direct destruction of wildlife.

The majority of the public is interested in public lands for recreational, aesthetic, and sporting opportunities rather than raising livestock. The APHIS ADC program is "archaic" because it does not reflect current public values of maintaining biological diversity and the stability of wildlife populations. The economy in the West continues to develop around outdoor recreation and other nonconsumptive uses of the land; therefore, wildlife is increasingly

more valuable in its native habitat. The tourist and recreational industries have overtaken the livestock industry as the primary source of income and jobs in the western states. The protection of native wildlife is an economic investment in the future of western states.

APHIS ADC should ensure the maintenance of diverse wildlife populations on public lands. There should be education programs for ranchers so that sound husbandry practices can be developed. Prohibiting grazing on public lands would allow the land to recover from overgrazing, allow wildlife populations to increase, create no net loss of revenue (since grazing fees are less than federal costs), and make public land more available for use by a wider range of the public.

The EIS needs to analyze the recreation and wilderness values that are adversely affected by the APHIS ADC program. Wildlife-caused damage on public lands set aside for "multiple use" cannot be judged by the same standards as losses on private lands. Consideration must be given to the cost of wildlife losses in terms of impact on other multiple-use activities of public lands. Wildlife has priority for the use of public land. APHIS ADC practices such as denning and use of toxicants should not be permitted on public lands.

RESPONSE: APHIS ADC does not have responsibility for management of public lands. BLM and the Forest Service, both cooperating agencies for this EIS, believe that the multiple-use concept is being implemented. The multiple-use concept explicitly includes the use of public lands for livestock grazing. APHIS ADC does provide services on public and private lands, although the current reporting system does not report data relating APHIS ADC activities on public lands versus private lands. The APHIS ADC program and associated activities on both public and private lands are the result of a policy decision by Congress to provide a service in the public interest through the legislative process. This is also true for grazing on public lands and for collecting grazing fees for that activity.

As the comment indicates, recreational use of land in the West is increasing. This trend does not mean that the livestock industry is of no importance. The EIS documents (in both Chapter 3 and 4; see, for example Table 3-16) that substantial amounts of resources are still invested in the livestock industry. In the West, ranch ownership is often widely dispersed, and individual owners may take advantage of overlapping grazing lands. Wildlife damage problems are not confined to discrete boundaries. Wildlife damage control can be more effective if managed collectively, rather than on an individual basis. The APHIS ADC program supports efforts extended by local governments and livestock owners and therefore facilitates collective management.

There does not appear to be any evidence that APHIS ADC activities are reducing the abundance or diversity of wildlife or recreational opportunities on public lands. The results of the biological impact assessment included in Chapter 4 indicate that APHIS ADC kills amount to less than five percent of total kills of the 17 target species analyzed. The number of recreational wildlife destroyed by APHIS ADC activities is relatively small when compared to the total numbers killed by hunting for sport (see the biological impact assessment in Chapter 4). No game bird populations known are limited by predators, most particularly any predators regularly targeted by APHIS ADC. Few, very few, ungulate populations are limited by predators targeted by APHIS ADC, and those few that may be so limited are in marginal habitats. No, or almost no, "watchable wildlife" populations are predator-limited. This issue is addressed in the Economic Impact Assessment in Chapter 4.

The comment advocates a different set of standards for judging losses resulting from wildlife damage on public lands, because "wildlife has priority." The multiple use concept explicitly recognizes the diverse interests and needs of different segments of the public with respect to the use of public lands. In responding to requests for assistance, APHIS ADC works with those requesting the assistance to address their wildlife damage problems. APHIS ADC assesses problems in terms of legality, agency purview, regulatory framework, and other considerations identified in the decision model described in Chapter 2. The decision model also allows for consideration of potential impacts of the use of control methods. The selection of

specific control methods (such as denning or the use of chemical control methods) is determined by taking these considerations into account. In other words, the APHIS ADC decision model allows for the balancing of interests. The safety of APHIS ADC methods is assessed in Appendix P, and commentors are also referred to Comment 14 for a discussion of issues related to APHIS ADC use of pesticides.

COMMENT 20: APHIS ADC has no way to monitor program activities or effectiveness.

No evidence was offered in the DEIS or SEIS that allows judgment of the success or failure of the program or conclusions that the program is not having serious impacts on wildlife populations. APHIS ADC should identify the criteria for evaluating costs, efficiency, and effectiveness of programs. Reliance on "kill" figures and reported monetary losses is not sufficient. APHIS ADC does not monitor activities to assess impacts or ranch and farm activities to ensure that these entities are not using lethal control methods on their own. The DEIS should have contained a "reservoir of information" on the effectiveness of past programs, but does not. There is no plan to monitor potential impacts of future activities. The EIS should address accurate record keeping and verification standards for documenting losses. Because tax deductions are available for losses due to predator kills, there is an incentive to inflate losses. APHIS ADC should institute regulations to prevent or correct abuses of the program by producers.

The EIS should discuss in more detail the oversight and enforcement of existing programs, decisionmaking at each level of APHIS ADC; follow-up enforcement of improper actions, and evaluations of APHIS ADC programs.

RESPONSE: The APHIS ADC program agrees that developing information systems and management methods that will enable provision of improved program services is an important goal. There is a considerable amount of data collected on program activities, including type of resource loss, target and nontarget species taken, methods used, and estimates of losses. The most detailed data are recorded by those States where the MIS is operational. Nationwide implementation of the MIS will facilitate more comprehensive program monitoring.

Some kinds of information are difficult to obtain, such as losses avoided because of program activities. That is to say there are no reliable nationwide estimates as to the amount of resources that were successfully brought to market because of the APHIS ADC program. However, there are studies, such as those referenced in the Economic Impact Assessment in Chapter 4 of the EIS, that indicate that wildlife damage control methods such as those provided by the APHIS ADC program can be effective in avoiding wildlife damage in local areas.

The issue of effectiveness is sometimes interpreted only as "cost effectiveness." Cost effectiveness is not, nor should it be, the primary goal of the APHIS ADC program. Additional constraints, such as environmental protection, land management goals, and others, are considered whenever a request for assistance is received. These constraints increase the cost of the program while not necessarily increasing its effectiveness, yet they are a vital part of the APHIS ADC program. Additionally, many of APHIS ADC's projects are implemented to ameliorate wildlife damage to nonmarket resources. These include control activities conducted to conserve federally listed wildlife species.

To ensure that the ADC program is capable of monitoring potential adverse impacts, and to meet its responsibilities under NEPA, APHIS has developed a monitoring plan. (See Chapter 5.)

COMMENT 21: APHIS ADC is a subsidy to livestock producers. Beneficiaries of APHIS ADC activities should bear the cost of the program. Producers should consider predation losses a normal cost of doing business and should insure themselves against loss. They could also pass along the cost of predation to the consumer.

APHIS ADC essentially uses tax dollars to slaughter millions of animals as a subsidy for the agricultural industry. In 1990, the APHIS ADC plans to spend $29.4 million on wildlife damage control, despite the fact that the losses suffered by the farmers, ranchers, and the agricultural industry from wildlife damage are far less than the cost of the program.

The program subsidizes ranching and agribusiness at the expense of other Federal projects, such as protection of wilderness areas. Moreover, the most significant impact of the APHIS ADC program is in the western United States, yet only a small amount (two to three percent) of the beef produced in this country comes from the West. Western ranchers do not have the right to expect the government to tailor and mold the forests and deserts to their own individual needs. Ranchers are too few and too unimportant to expect such subsidies. If ranchers and farmers insist on raising crops and livestock in remote places subject to wildlife damage, then consumers should pay the costs. Continuation of this "welfare program for ranchers and crop growers" is a blatant misuse of public funds, especially in view of the current Federal budget crisis. Ranchers and other business people wanting to protect their private property should purchase insurance for that purpose or raise their prices and pass the cost on to the consumer. The APHIS ADC's mission in the West should be to teach livestock ranchers to "stand on their own two feet," not to spend taxpayer dollars. The present program will not lead to improved animal husbandry practices, but rather allows turn-of-the-century livestock management to continue. The "need" for livestock protection and subsidy of the industry arises from the fact that the industry is attempting to run livestock in places and with methods that are totally inappropriate.

RESPONSE: Programs like APHIS ADC reflect policy decisions made by Congress or State legislatures directed at serving the public interest as defined through the legislative process. Although the APHIS ADC program does support ranching and farming operations, it considers the expenditures and efforts of landowners to manage productive livestock businesses within the owner's control. In this way, the program presumes that operators will engage in responsible husbandry practices. The EIS includes an analysis of the impacts of requiring recipients of program services to use basic husbandry standards (see Chapters 2,4, and 5). APHIS ADC personnel provide technical assistance to assist in developing effective wildlife damage management practices. APHIS ADC activities are conducted in a holistic way so that control is effective, balanced, and efficient for an entire area. Direct control and technical assistance are also provided to producers of other types of livestock in the East as well as to farmers who produce a variety of crops and other farm products. The APHIS ADC program serves urban and industrial interests by controlling wildlife damage to private property, assisting with the protection of the health and safety of airline passengers at airports, and helping to deter the spread of wildlife-borne diseases. As the requests for assistance change, the mix of services provided by the APHIS ADC program will change accordingly.

It should be emphasized that "confirmed loss" data, to which many commentors referred, do not represent the total magnitude of wildlife damage. Collection of confirmed loss data is limited to losses associated with direct control activities and is conducted to substantiate the occurrence of wildlife damage, the species responsible for damage, and the need for assistance. It is therefore inappropriate to compare program expenditures with confirmed losses as a measure of program performance.

Regarding the suggestions that ranchers and other business people should cover management costs associated with animal damage by raising prices and passing these costs on to consumers, it should be realized that farmers do not control market prices and therefore are not able to pass such costs on to consumers by raising prices.

COMMENT 22: The APHIS ADC program is wasteful and inefficient and does little to help agriculture. Tax dollars should not be spent on this program. Instead, they should be spent on more socially acceptable uses, such as protection of native wildlife.

The current program is wasteful and ineffective and does nearly nothing to help agriculture. While "substantial damage" continues, the APHIS ADC budget increases. The current APHIS ADC program kills more than 85,000 coyotes per year, despite studies that prove that such kills are ineffective in reducing livestock losses.

The wildlife damage control program is ill-conceived, ineffective, wasteful, and destructive of a myriad of resources. The program is causing the preventable destruction of millions of animals and at the same time not bringing about the desired results. Such action is immoral, environmentally unsound, and a sick, wasteful use of tax money and man-hours. The program fails at its purpose, which is to increase productivity of agriculture. It is, on a practicable basis, a waste of money, for there are other ways of protecting livestock humanely, i.e., the use of guard dogs and burros that fend off predators. Nearly $30 million spent on wildlife damage control far exceeded the losses suffered by farmers. The lack of information from the USDA leaves many questions about the program's effectiveness.

The current program of merely killing as many animals as time and manpower permits has not, in the past, proved to be effective for any duration of time, and it certainly has been costly to taxpayers. Other nonlethal methods of protection would be more effective, and funds would be better spent for other purposes. The current program is a waste of money, knowledge, and wildlife. APHIS ADC funds should be given to homeless people, medical research laboratories, or overseas missions. The APHIS ADC program is a "waste" or "misuse" of hard-earned taxpayer dollars. The APHIS ADC program is operated largely in secret. If APHIS ADC's activities were known to the public, they would be considered socially unacceptable.

APHIS ADC should be responsive to the public's concerns, including the welfare of wildlife, protection from environmental risks of the lethal chemicals used by APHIS ADC, and the use of public funds to control wildlife on public lands. APHIS ADC should provide leadership in effective and humane wildlife damage control and management by providing technical assistance and research on humane methods of damage control and should require the use of nonlethal and preventive control techniques with partial compensation for losses. The money used to fund the APHIS ADC program could better be used for the protection and preservation of wildlife. Tax dollars should not be used to write another EIS.

RESPONSE: Tax dollars appropriated to the program are congressionally designated to be spent on wildlife damage control activities as broadly identified in the Animal Damage Control Act of 1931 and the Rural Development, Agriculture, and Related Agencies Appropriations Act of 1988. As such, these funds are used to protect agriculture, personal property, and natural resources (including threatened and endangered species) from wildlife damage as well as to safeguard public health and safety. These funds may be spent on private or public lands in accordance with national, state, or local laws to conduct wildlife damage control activities, and based upon requests for services. The purpose of the program is much broader than stated in the comment.

There is a substantial amount of wildlife damage remaining throughout the United States even with the efforts of the APHIS ADC program. This does not warrant the conclusion that program is inefficient or ineffective. If anything, the total amount of wildlife damage suggests that increased efforts to manage such damage are necessary. Studies indicate that wildlife damage control methods such as those provided by the APHIS ADC program are effective in avoiding wildlife damage in local areas (examples of such studies are referenced in the Economic Impact Assessment in Chapter 4 of the EIS). These conclusions are supported by the GAO's finding in its 1990 report, "Wildlife Management: Effects of Animal Damage Control Program on Predators," that "according to available research, localized

lethal controls have served their purpose in reducing such predator damage" (GAO 1990). While temporary, localized population reduction of certain wildlife species — including coyotes — responsible for damage has been demonstrated to reduce damage, the program strives to achieve maximal damage resolution with minimal impacts to the biological environment. The comment raises additional questions regarding the potential risk of APHIS ADC methods, the humaneness of APHIS ADC methods, and APHIS ADC activities on public lands. Those interested in obtaining additional information regarding these issues are referred to Comments 14 (risks of pesticides), 13 (humaneness of methods), and 19 (public lands).

The program uses an IPM approach to wildlife damage management that considers all available approaches in its methods evaluation (see also Comment 11). Nonlethal methods are given preference where practical when formulating a control strategy. When nonlethal methods alone are not practical, the program uses or recommends a combination of lethal and nonlethal methods to address damage problems. Often, nonlethal methods are already being used by those sustaining damage. Therefore, the efficacy of the control strategy using both lethal and nonlethal methods is enhanced. Ultimately, the goal is to preserve wildlife while resolving conflicts between humans and wildlife.

Although the help provided to agriculture by this reduction in wildlife damage cannot be measured with as much precision as might be desired, the APHIS ADC program results in benefits to agriculture. Control of damage to farm crops and protection of public health and safety also are contributions of the APHIS ADC program beyond that of the protection of livestock most often mentioned in the comments. In regard to inhumane treatment of wildlife, nonlethal methods are recommended by APHIS ADC personnel and promoted through technical assistance activities. Research will continue in an effort to further develop improved and humane control methods for use in the future.

Tax dollars spent on the APHIS ADC program have been appropriated by Congress based on its decision to serve the public interest by avoiding damage from wildlife. These expenditures are not only for the good of agricultural producers but for the health and welfare of the general public and other urban and industrial concerns. In addition, to the extent that APHIS ADC control methods eliminate predators that prey on other wildlife, such as game or threatened and endangered species, APHIS ADC activities contribute to the protection of wildlife valued for recreational purposes. Regarding concerns about spending tax dollars on the use of lethal control methods, APHIS ADC will continue to devote funds to research to improve control methods, both lethal and nonlethal, and will encourage animal husbandry techniques through technical assistance activities.

APHIS complies with NEPA. When required to do so by NEPA, appropriate environmental documentation will be provided. Some of the additional NEPA documentation that will be conducted is identified in Chapter 1.

COMMENT 23: APHIS should present a cost-benefit analysis of the program.

A cost-benefit analysis of the program as a whole is required so the public can determine for itself the difference between alternatives. There is no direct comparison made between total costs of the APHIS ADC program and the losses of agriculture and livestock production averted by the program. Data from the DEIS (in Tables 3-12 through 3-20 and Figures 3-18 through 3-28) are misleading. These tables do not include all costs of the program, and the value of agricultural production serves little function in the analysis. Since Federal predator programs are largely justified because they reduce economic losses, it is essential to provide evidence that the program does reduce losses. APHIS ADC should generate adequate information concerning damage and benefits to better assess the effectiveness of the program and to implement an IPM plan.

A detailed economic analysis must be done without grossly exaggerating the cost of wildlife damage. The analysis must include all direct and indirect costs of the APHIS ADC program and not underestimate the value of wildlife to society. This includes the costs of wildlife losses in terms of multiple uses of public lands and the losses to nontarget species, including endangered species, resulting from lethal control.

The DEIS and SEIS are inadequate because of the lack of quantitative analysis or scientifically accepted methods of loss analysis and the absence of meaningful data to justify the program. Since important data are absent or outdated, all lethal methods of control should be stopped until definitive data are developed to show that methods are cost-effective. There is no evidence that market price would increase if APHIS ADC were abolished or that consumers would assume increased product costs created by higher production costs.

APHIS used subjective words, not monetary figures, as a basis for analysis of alternatives. The same advantage and disadvantage of an alternative can be enumerated more than once under different terminology. APHIS's "preconceived notions" of what is economical to do under a given alternative is a poor guide to public policy. Intuitive judgment is not needed; what is needed are detailed figures of prospective receipts and disbursements for specific alternatives.

APHIS should try to distinguish between those advantages and disadvantages that can be reduced to monetary terms and those that are not so reducible; there would then be a reliable basis for decisionmaking. No such basis is available in the Draft EIS. The economic question concerning alternatives should be reduced to: does it seem likely that the proposed investment in the proposed alternative will ultimately be recovered? Also, is the return on investment in the APHIS ADC program attractive to the public considering the prospective returns obtainable in like risks to the human environment?

Calculations to determine the prospective rate of return to the environment must be made, and the selection of an alternative must give weight to the prospective differences between alternatives. The economic analysis should be current and not be limited to FY 1988.

RESPONSE: CEQ regulations (40 CFR 1502.23) do not require a formal, monetized cost-benefit analysis. "For purposes of complying with the Act, the weighing of the merits and drawbacks of the various alternatives need not be displayed in a monetary cost-benefit analysis..." These regulations also note that a cost-benefit analysis may not be appropriate when there are significant qualitative issues involved. The approach taken in the EIS (see the Economic Impact Assessment in Chapter 4) weighs the economic merits and drawbacks of the five program alternatives. The major conclusions of that analysis are worth summarizing here. With regard to the Current Program Alternative, there is evidence that the use of control methods can be effective, even though the precise monetary value of avoided losses cannot be rigorously established. Further, the current program offers economies of scale on a number of levels: controlling externalities resulting from mobility of predators, providing for conduct and dissemination of research leading to improvements in wildlife damage management, and standardizing approaches to wildlife damage management. Many of these advantages could be lost through the No Action Alternative, although the taxpayers may save funds expended on the program. The Damage Compensation Program Alternative would provide some financial relief for producers from losses due to wildlife damage, but at additional costs, which include the neglect of nonmarket resources (health and safety of airline passengers), and the potential for greatly increased growth of program personnel and costs, primarily at the State level. The "nonlethal only" alternative would reduce some program costs as clients went out of business since many types of damage could not be addressed, however the residual efforts by APHIS ADC employees would cost more to implement. Costs to clients would increase as they would have to take over their own control activities. The costs and benefits of this alternative would eventually be the same as the No Action Alternative as the program is eliminated. The "Nonlethal Before Lethal Program Alternative" would be more costly to both the program and to clients and this could lead to less productivity and efficiency on the the part of the program and loss of businesses to APHIS ADC's

clients (see response 27). Based on this analysis, the current program alternative appears to offer a favorable ratio of benefits to costs, even though these costs and benefits cannot be rigorously quantified.

As stated in Chapter 1, the primary justification of the APHIS ADC program is to resolve conflicts between humans and wildlife. This justification is both different and broader than "reducing economic losses." The APHIS ADC program addresses a broad range of conflicts between humans and wildlife. Such conflicts will increase in the future, and the need for professional management of such conflicts will also increase.

In response to the comments on the SEIS, the economic information presented and reviewed was re-analyzed and presented in Chapter 4. The problems concerning monetizing qualitative information still exist but the analysis attempts to show how the information can be used to establish specific resource values and explore the concerns with avoided losses.

COMMENT 24: APHIS ADC is not a cost-effective program.

The cost of the APHIS ADC program far exceeds the costs of losses to the farmers and ranchers from wildlife damage. If animals must be killed, the costs should not exceed how much farmers claim they have lost from wildlife damage. The program's approach is rather "like killing a mosquito with a Mack truck." Monies should be more wisely spent on programs to preserve habitat and restore populations of endangered species.

The APHIS ADC program is not economically effective because it produces only short-term effects on target species. For example, birds quickly get used to scaring devices, and shooting is highly labor intensive. Even with APHIS ADC activities, crops are still lost, birds and planes still collide, and ranchers still suffer losses. Tables 3-12 through 3-20 and Figures 3-18 through 3-28 fail to demonstrate the cost-effectiveness of the program because direct comparisons are not made between all costs and the agricultural losses asserted. Nothing in the DEIS justifies the risk of $30 million annually with no return on investment.

Other examples demonstrate that the program is not cost-effective. A total of $3.4 million was spent to "exterminate mammals" in California in 1988, while it was estimated that damage done to ranchers' livestock in the State that year was $1.4 million. Losses would have been greater without killing predators, but farmers could have been compensated for losses twice as great as those reported, and money would still have been saved. The money spent to kill 32,000 mammals amounted to about $100 for each animal, and the damage they allegedly caused was less than half of what it cost to destroy them. Farmers and ranchers could have been indemnified for their $1.4 million in losses with savings of $1.8 million, but they got nothing.

In 1989, $1.6 million was spent in New Mexico on control, while claimed losses amounted to $1.7 million. Many scientists have testified that control methods, such as the use of compound 1080, have had little effect on reducing sheep losses. The Statistical Reporting Service found that losses did not vary appreciably between a 21-year period when the compound was used and a nine-year period when it was banned.

The core contention of this program is that for the sake of avoiding certain losses of agricultural commodities (specified or at least estimated in dollar value), it is justifiable and economically sound to provide funds for indiscriminate slaughter of any and all animals that might be implicated in those losses.

RESPONSE: Cost effectiveness cannot be determined by comparing APHIS ADC expenditures with the value of claimed or confirmed losses from wildlife damage, as most of the comments suggest. APHIS ADC confirmed losses are associated with direct control activities and are intended to document wildlife damage as the source of loss. Confirmed losses do not represent the full value of losses. The most valid way to determine if the program is cost-effective is to compare APHIS ADC expenditures to the value of the losses that have

been avoided by direct control and technical assistance. Measuring avoided losses, however, is difficult, if not impossible, because of the logic of trying to account for an event that did not occur. Little data exists for losses prevented by wildlife damage control activities. Studies referenced in the Economic Impact Assessment in Chapter 4 of the EIS indicate that wildlife damage control methods such as those provided by the APHIS ADC program can be effective in reducing or avoiding wildlife damage in local areas. These conclusions are supported by the GAO's finding that "according to available research, localized lethal controls have served their purpose in reducing such predator damage" (GAO 1990). The expanded analysis in Chapter 4 (see response to COMMENT 23) gives more insight into "avoided losses."

Wagner (1988) reviewed the research on the economic effects of compound 1080 baiting. Compound 1080 baiting was discontinued by the APHIS ADC program in 1972. This practice is not relevant to the broad range of methods used by the current APHIS ADC program and should not be considered representative of the IPM approach. Thus, the information regarding compound 1080 cited here does not address the effectiveness of an IPM-based approach.

As noted in the response to Comment 22, CEQ Regulations do not require a formal monetized cost-benefit analysis. For an EIS such as this, it is more appropriate and useful to identify the merits and drawbacks of the five program alternatives. The approach taken in the Economic Impact Assessment in Chapter 4 was broader than suggested by this comment. For example, the assessment identified some collective benefits, such as research and maintenance of pesticide registrations, which are benefits of the current program but would likely be lost if the no action or compensation alternatives were implemented. Such collective benefits increase the cost effectiveness of the current program. In addition, cost effectiveness must take into account the types, costs, and benefits of services to non-agricultural facilities and to public health and safety. These issues are addressed in the Economic Impact Assessment in Chapter 4.

COMMENT 25: The APHIS ADC budget should be increased.

The APHIS ADC program is an effective method of controlling wildlife damage to the livestock and agricultural industries. Consideration should be given to expanding the budget to attain further benefits for both producers and consumers. If there is no increase in the APHIS ADC budget, meat and crop prices will increase, causing a negative impact to the consumer. Yearly increases in funding are necessary to maintain existing programs. If the program is not continued with increased funding, the adverse impact on the ranching industry and associated small communities would be devastating.

Updating aging equipment, hiring additional APHIS ADC agents to meet the growing demand for services, and the increasing coyote range necessitate an increase in the APHIS ADC budget. Additional funds are also required to develop public information and education services to counter "misinformation and negativism." Because the program administers complex interactions coping with the problems of national wildlife control in cooperation with Federal, State, and local agencies, APHIS ADC needs to have an expanded role with greater flexibility. APHIS ADC needs adequate support to play a lead role in resolving conflicts between humans and wildlife.

The impact of the Endangered Species Act requires increased funding to maintain the present program, "a financial cost of the environmental movement." More funds are needed to compensate for increasing reliance on more costly control techniques rather than chemical controls. Funding to reduce bird and deer damage should be made available. More funds are needed to provide protection for game.

RESPONSE: Thank you for your comment.

COMMENT 26: APHIS ADC should collect total loss data.

APHIS ADC should collect data that would provide accurate information regarding the total losses resulting from wildlife damage. The DEIS contained no quantitative analysis of livestock and crop losses due to wildlife. The draft should be redone to include a quantitative analysis of losses due to specific targeted "pest" species. Data should be collected for losses during the last ten years, and funding should be provided to APHIS ADC to collect these data through the State agricultural services. National livestock losses from predation are greater than currently reported.

RESPONSE: A system capable of collecting and processing total loss data on a national scale currently does not exist. Implementation of a system to account for total losses of all types of livestock, all types of crops, human health and safety, and natural resources caused by the variety of wildlife species involved would require an extensively expanded program. It would need to address the losses resulting from all wildlife damage, regardless of APHIS ADC involvement, the losses occurring to properties on which APHIS ADC provides direct control assistance, and the losses occurring to properties on which APHIS ADC provides technical assistance. Such a program would require many times the number of personnel now available within the APHIS ADC program and would be extremely costly.

Within the APHIS ADC program, efforts are under way to collect and process more comprehensive data through a nationwide Management Information System (MIS). Several States already have extensive data collection programs that record resource losses, target and nontarget species taken, and other relevant information. Program data collection activities will expand as the MIS system evolves. APHIS ADC anticipates that the availability of an expanded MIS system will assist in improving its ability to provide enhanced and more effective services in accordance with its mandate.

In 1988, the APHIS ADC program began to collect survey information on national, regional, and State-by-State losses of selected agricultural industries to wildlife damage by contracting with the USDA National Agricultural Statistics Service (NASS) to collect such information. These surveys have resulted in estimates of the fractions of U.S. farmers sustaining damage from various classes of animals (NASS 1989), sheep and goat losses to predators (NASS 1991), and cattle and calf losses (NASS 1992) to various causes, including predators. Summaries of these data are included in the Economic Impact Assessment in Chapter 4 of the EIS and indicate that losses from wildlife damage are substantially higher than damage currently reported to APHIS ADC. The NASS studies are included as Appendix M.

COMMENT 27: APHIS should use nonlethal methods only, plus compensation where nonlethal control does not reduce damage to acceptable levels. Producers and APHIS ADC should increase research and application of nonlethal and more humane methods. Lethal methods should be used only after nonlethal methods have been tried and found to be unsuccessful.

Compensating farmers or ranchers for losses is an alternative to the current program. For example, the Wisconsin approach is a combination of technical assistance, direct control, and compensation. Compensation claimants must first implement abatement practices and hunting access. Compensation would be more humane. Compensating farmers for their losses would be more "cost-effective" or "cheaper" than the Current Program Alternative. In the California program, the cost of control was approximately equal to the recorded losses. Compensation programs should be limited to verified losses. Compensation programs should be seen as an interim measure to be implemented along with a restructuring of the program that would result (in time) in "natural" methods of control.

The EIS should focus on research and application of such nonlethal techniques as taste aversives, better fencing, strobe lights, scare tactics, painless poison, full-time herders, shed lambing, guard dogs, removal of livestock from areas of high risk, education, and improved

animal husbandry techniques. The emphasis of the program should be on nonlethal methods of wildlife damage control as a first course of action, allowing lethal methods only after nonlethal methods have been tried and failed and only if nontarget species are protected. Tax dollars should be used to increase funding for research, development, and application of nonlethal and preventive methods. Tax dollars would be saved by implementing nonlethal methods. APHIS ADC does not effectively address nonlethal methods as an alternative in the DEIS and is deliberately refusing to conduct research on humane control methods.

RESPONSE: Based on the comments on both the DEIS and SEIS, two additional alternatives have been analyzed in the final EIS. These are the "Nonlethal Control Program Alternative" which does not allow APHIS ADC to use or recommend any methods that are directly lethal to wildlife, and the "Nonlethal Before Lethal Control Program Alternative" which *requires* nonlethal methods to be used prior to recommending or using lethal methods. The analysis of these alternatives is contained in Chapter 4.

Compensation is used by some State agencies to fully or partially reimburse farmers and ranchers for specific types of losses. Such programs are limited to specific kinds of damage caused by selected wildlife species so that only a fraction of total wildlife damage is covered. Moreover, these programs often limit the amount of compensation that may be paid for damage cases. In Minnesota, losses from elk damage to crops and eagle or wolf damage to livestock or domestic animals are covered. Ohio compensates agricultural resource owners for coyote damage. These examples, as well as the cases of Wisconsin and Wyoming, are discussed in the section "Compensation Alternative" in Chapter 2.

The Economic Impact Assessment in Chapter 4 concludes that the potential costs to taxpayers of administering a generalized wildlife damage compensation program would be prohibitively high. In addition to the high costs of compensation payments, loss verification and claims processing would require considerable expansion of staff and activities, adding further to the expense of the program. Additionally, many wild birds and mammals pose threats to public health and safety where compensation is not practical. Reduction of these public health and safety risks is addressed by the Current Program Alternative.

APHIS ADC implements a strong research and development program through the Denver Wildlife Research Center. One of the purposes of the research currently being conducted by APHIS ADC is to develop and improve nonlethal methods and to promote broader application of these methods in the future. Examples of such research are mentioned on pages 5-2 and 5-3 of the EIS. The agency continues to look at new methods of wildlife damage control. Additionally, APHIS ADC conducts an educational outreach program through which ranchers and farmers are taught how to use many of the nonlethal techniques. These techniques include fencing, scare tactics, guard dogs, and other animal husbandry practices. A complete listing of methods recommended or used by APHIS ADC is included in Chapter 2 (see Table 2-4 and the accompanying discussion). As noted there, APHIS ADC considers the use of nonlethal methods in making decisions about the appropriate response to a request for assistance and uses or recommends nonlethal methods where practical.

Nonlethal methods are an important component of any program using an IPM approach. The analysis shows that the use of nonlethal methods alone could result in a substantial increase in losses as well as an increase in expenditures. Likewise, a blanket prohibition of the use of lethal controls until nonlethal controls have been tried and found to be unsuccessful could result in increased losses to resource owners. A major increase in expenditures could threaten the existence of some producers without some form of compensation, particularly those with marginal operations. The difficulties and high costs of compensation programs have been documented in the literature and in Chapter 4 of this EIS. The APHIS ADC IPM approach can be considered an efficient and cost-effective method of wildlife damage control.

Commentors who are concerned about the range of APHIS ADC control methods, the use of nonlethal methods, and their evaluation in this EIS should also refer to Comments 4, 11, 12, 14, and 28.

COMMENT 28: Prior to providing services, APHIS ADC should require producers to meet minimum husbandry standards or wildlife damage thresholds, OR APHIS ADC should NOT require such standards or thresholds.

In one view, the use of minimum husbandry standards or management standards should be a requirement for obtaining APHIS ADC assistance. Instituting minimum husbandry standards would force livestock operators to be more conscientious in the management of their herds, show a commitment to preventing wildlife damage, and share the responsibility for their losses. The removal of livestock from areas of high loss is an effective means of reducing the losses to the livestock industry and therefore decreases the need to use lethal controls on predators. Remote areas with a high density of predators should be reserved entirely for wildlife. Minimum husbandry standards are especially applicable to producers who use Federal land. Being a tenant on Federal land is a privilege given to those tenants by the Federal government; therefore, those tenants should have to use more modern methods of ranching and wildlife damage control available to them.

The APHIS ADC budget could be reduced by forcing producers to pick up some of the financial burden of wildlife damage control. To ensure equal access to all levels of service and to avoid financial hardship, minimum husbandry or management standards should be linked to a sliding scale based on income.

Requiring minimum husbandry standards is a very important mitigation measure. APHIS should give it high priority on the list of proposed mitigation measures.

A contrasting view expressed disapproval of the use of minimum husbandry standards or management standards before producers can obtain APHIS ADC assistance. If such programs were instituted, APHIS ADC would change from a service agency into a regulatory agency. APHIS ADC personnel would be obligated to enforce minimum husbandry standards.

APHIS ADC should establish a threshold of damage as a requirement for receiving APHIS ADC assistance. According to this concept, a farmer or rancher could receive APHIS ADC services only after losses had occurred. Establishing such threshold levels was viewed as an important alternative to the current program that had not been sufficiently considered in the DEIS. Loss levels should be set at higher levels for livestock grazing on public lands and for those ranchers who do not first implement nonlethal methods.

However, another view is that the use of a threshold of loss as a requirement for receiving APHIS ADC services should not be implemented. Both absolute loss numbers and percentage losses are an inadequate basis for loss thresholds. In the case of absolute numbers, small producers could sustain unaffordable losses without APHIS ADC assistance because the threshold level could be a large portion of their resources. A percentage threshold would allow small producers to qualify for APHIS ADC assistance after a minimal number of predator kills, while large producers would have to lose large numbers of animals before meeting the threshold.

RESPONSE: This comment highlights the sometimes differing interests and needs of the public as they relate to wildlife and wildlife damage management, and the resulting position in which wildlife management agencies may find themselves. APHIS ADC is a cooperative program. Producers contribute a significant portion of program funding. The EIS recognizes the importance of good husbandry and management practices in helping to reduce wildlife damage (see Chapter 2). These practices are promoted in program literature and in personal consultations with affected resource owners. The additional analysis of the "Nonlethal Before Lethal Control Program Alternative" addresses this comment directly

(see Chapters 2 and 4). Requiring the removal of livestock from remote areas with high levels of depredation is beyond the scope of this EIS. APHIS ADC provides a service, i.e., technical assistance and/or direct control to reduce wildlife damage or other conflicts. Protection of resources is the objective, and APHIS ADC services are available to all who request assistance. Animal husbandry information and technical assistance will continue to be provided by APHIS ADC.

COMMENT 29: Is the DEIS correct in stating that APHIS ADC activities help to control the spread of rabies?

The DEIS states that the APHIS ADC program helps to control the spread of rabies. Studies demonstrate that the extermination of natural predators of rodents increases the incidence of rabies. Trapping and killing animals has not been demonstrated to be an effective method for controlling the spread of rabies. APHIS ADC should provide evidence that would support its contention that the program inhibits the spread of rabies.

RESPONSE: APHIS ADC makes its primary contribution through rabies surveillance projects conducted in conjunction with the USPHS and State public health agencies. APHIS ADC personnel help these agencies monitor rabies in wildlife populations. Information about the number of rabies surveillance projects for 1988 - 1991 is included in the Economic Impact Assessment in Chapter 4. In addition, APHIS ADC personnel are frequently called to remove individual skunks and raccoons suspected of being rabid in urban and suburban areas. APHIS ADC also has cooperative agreements in a number of areas to assist in controlling localized outbreaks of the disease in wildlife populations. Integrated programs of skunk removal, research, and public education have contributed to limiting the spread and establishment of rabies in striped skunks within prairie regions of Alberta and Montana (Pybus 1988).

A recent example of APHIS ADC's contribution to rabies control illustrates a number of factors that can be involved in the spread of the disease, as well as APHIS ADC's role. A recent outbreak of rabies among coyotes in Texas has been attributed to movement of infected wildlife from Mexico into Texas, as a result of Hurricane Gilbert in 1988. Subsequently, drought lured many animals to populated areas, where food and water were more readily available. As part of the response to this outbreak of rabies, APHIS ADC has assigned 10 staff members to the seven affected counties (N.Y. Times 1992).

COMMENT 30: The APHIS ADC program should operate under different regulatory or organizational arrangements.

The ADC program should not have been transferred to USDA and should be transferred back to USFWS. The DWRC should be transferred back to ADC from APHIS. Similarly, the work of the Pocatello Supply Depot should be transferred to DWRC. The APHIS ADC program, not USFWS, should have authority to issue permits to take migratory waterfowl. This would allow greater protection of aquaculture resources and crops. In general, APHIS ADC should explain how it intends to operate within the complex regulatory framework where wildlife management responsibility lies with other agencies.

RESPONSE: Although there is some public concern that the ADC program operates on a less environmentally sound basis since being transferred to USDA, this concern is unwarranted. The EIS analyzed five organizational arrangements, concluding that some simply transfer the kinds of anticipated impacts from one proposed arrangement to another, while others place greater or lesser emphasis on direct control, research, or technical assistance. This analysis is contained in Chapter 2. As the EIS indicates, implementation of the APHIS ADC program is not expected to result in significant adverse impacts. Procedures to identify significant impacts to local populations and mitigate risks of specific APHIS ADC control methods have been established. APHIS has placed DWRC administratively under the

direction of the ADC Deputy Administrator, and the Director of DWRC will become a member of the APHIS ADC top management team.

The issue of permitting authority referred to in the comment is not within the scope of this EIS.

The APHIS ADC program's relationship to other wildlife management agencies is discussed in Chapter 2. APHIS ADC activities are conducted in compliance with applicable Federal, State, and local laws and regulations and within the framework of cooperative relationships with many other agencies that have wildlife management responsibility.

Commentors are referred to Comment 4 for additional information.

COMMENT 31: APHIS ADC needs a Public Information program.

APHIS ADC should establish a public relations/information office to clarify many misunderstandings surrounding the program. The public relations office should explain APHIS ADC efforts to minimize harmful effects of control methods, APHIS ADC's positive role in "wildlife management," and its use of humane and environmentally sensitive control methods. The public relations office should inform the public of the economic impacts of wildlife damage. A public information office is also necessary to counteract the "bad press" and "misinformation" dispersed by the "environmentalists."

RESPONSE: APHIS currently conducts public information activities, many of them focused toward specific groups or audiences. APHIS ADC field staff provide technical assistance, much of which takes the form of information regarding practices that can reduce wildlife damage, such as animal husbandry techniques, guard dogs, fencing, or the use of specific chemicals. Based on the number of requests for assistance received, APHIS ADC will determine specific needs for material to provide for the growing need for information about how to prevent or reduce damage from wildlife. APHIS ADC intends to increase both its scientific and public information as requested, in conjunction with USDA's Bureau of Legislative and Public Affairs.

COMMENT 32: The Animal Damage Control Act of 1931 should be revised or repealed.

The Animal Damage Control Act of 1931 is outdated and does not reflect public attitudes concerning public land use and preservation of wildlife. The use of terms like "campaign for destruction" and "eradication" in the Act are no longer generally acceptable. Either the Act should be repealed altogether because it leads to the "slaughter of animals," or the Act should be revised, taking into consideration current public attitudes and environmental laws and constraints.

RESPONSE: Congress has reviewed the Animal Damage Control Act of 1931 several times since its passage and has considered proposals to alter or replace the Act or strongly alter the program, but has not done so. The Act was written in commonly used terms of the times that allowed for a high degree of flexibility and program variation. The contemporary program administered by APHIS ADC reflects changes that have occurred in public attitudes and wildlife damage management philosophy. The program operates in compliance with public laws governing wildlife management and environmental protection. This is more fully described in Chapters 1 and 2.

COMMENT 33: The current APHIS ADC program deserves or does not deserve support.

Commentors were divided in their support for the program.

RESPONSE: APHIS is aware that elements of the ADC program are controversial and are likely to elicit either support or opposition. APHIS also recognizes that elements of the ADC program conflict with values and attitudes of some segments of the public (see the sociocultural impact assessment in Chapter 4). Chapter 5 identifies some measures to mitigate the sociocultural concerns reflected in the comments. However, it will never be possible to create an ADC program that is completely acceptable to all interested parties.

COMMENT 34: We have no comment on the DEIS.

Several letters from Federal and State agencies were received that provided no substantive comments on the DEIS.

RESPONSE: APHIS ADC thanks these commentors for their time and effort in reviewing the DEIS and also for their interest in the program.

Other Comments Not Included in the Above Categories

Commentor No. 8

COMMENT: There are more coyotes now than ever, and less rare mountain lions, bears, and other valuable wildlife.

RESPONSE: The EIS analyzed current population estimates and population trends for the species identified. As shown by Tables 4-24, 4-25, and 4-27 the available estimates show that these populations are either stable or increasing.

Commentor No. 11

COMMENT: In Appendix H (Nebraska), prairie dogs are not included, yet Table 4-15 shows nearly 95,000 killed. Why?

RESPONSE: The comment is correct. The reason for the variation is that different sources of data were used. Appendix H relies on APHIS ADC Annual Reports, while Table 4-15 (Table 4-20 in this EIS) was based on estimates developed from population densities, acres treated, and chemical efficacy. APHIS ADC reports of animals killed (Appendix H) consist of animals personally verified by APHIS ADC employees. Most prairie dogs are killed by toxic baits or fumigants. They die underground, so are not counted. Therefore, the number of prairie dogs killed in Nebraska does not appear in Appendix H. This apparent discrepancy has been clarified in the discussion "Prairie Dog" in this EIS.

Commentor No. 38

COMMENT: At best, the report is likely to be seen by only a handful of psychologists and I find that fact quite disturbing. Taken as a whole, feral animal damage to valued human resources in the United States is a behavioral problem which should have psychologists serving as the predominant professionals in Federal, State and private programs involved in basic research and technical application.

RESPONSE: The analysis presented in the EIS addresses a variety of wildlife damage problems, not just damage caused by feral animals. Wildlife damage control is accepted as a part of the discipline of wildlife management. Currently, professional wildlife biologists manage and conduct the APHIS ADC program.

Commentor No. 98

COMMENT: Pages 1-3, how many individuals in the past have used methods that were environmentally harmful and broken the law? What did APHIS ADC do to them? Any such incidents must be prosecuted vigorously and fully by APHIS ADC.

RESPONSE: APHIS ADC is not a regulatory or law enforcement agency, and therefore has no legal authorization to address situations referred to by the commentor. Other agencies may have a mandate to investigate and prosecute violators.

Commentor No. 169

COMMENT: According to the latest available statistics from the Montana Agricultural Statistics Service, predators caused two million dollars in loss in 1989. Coyote predation led the predator loss tally to the tune of 1.5 million dollars and is the single largest death cause of sheep in our state, some twenty percent. If it were not for the current level of APHIS ADC control work in Montana who knows what that total would be today. One thing is for certain, without the control work more producers would be forced out of the sheep business in our state.

RESPONSE: Thank you for providing this information. Your interest in the APHIS ADC program is appreciated. The Economic Impact Assessment in Chapter 4 of this EIS presents data on the extent of animal damage nationwide, based on surveys of agricultural operators conducted by the National Agricultural Statistics Service.

Commentor No. 194

COMMENT: The wolf must be reintroduced to many regions according to the Endangered Species Act and they very effectively control the coyote population. Wolves can also be safely staved off with dogs.

RESPONSE: Such introductions are cooperatively conducted by the U.S. Fish and Wildlife Service, respective State wildlife management agencies and, where appropriate, with involvement of Federal land management agencies. In addition to the routine conduct of activities to protect threatened and endangered species, the APHIS ADC program provides damage management assistance specifically to enhance such reintroduction efforts. In some instances, dogs may have applicability in minimizing wolf depredation to livestock. APHIS ADC is not aware of data indicating that wolves control coyote populations, and would appreciate receiving any such references.

Commentor No. 218

COMMENT: Aquaculture is one of the few industries creating wetlands. The overall benefits to wildlife outweigh the limited take of predatory birds for control purposes.

RESPONSE: As indicated in Chapter 3, aquaculture is a growing industry in the United States. This is producing increased habitat for many wildlife species associated with wetland habitats and is a significant factor in increased populations of some of these species. Increased depredations of aquaculture resources have also occurred. The positive effects on wildlife populations and the resultant conflicts with commercial ventures are reflective of the need for professional wildlife damage management assistance.

Commentor No. 225

COMMENT: Continuing animal damage control efforts are an integral part of the proper management of all wildlife resources on both public and private lands utilized for livestock grazing purposes.

RESPONSE: Thank you for your comment.

Commentor No. 233

COMMENT: To continue the "current program" of Animal Damage Control, violates several existing laws and will invite legal action.

RESPONSE: The current Federal APHIS ADC program, which is ecologically sound and professionally managed, complies with applicable laws and regulations.

Commentor No. 237

COMMENT: On page 4-32, the statement is made: "The APHIS ADC program operates within the constraints of international, national, and State laws and regulations enacted to ensure species maintenance and viability." This statement suggests that without such laws APHIS ADC would have no interest in species maintenance or viability.

RESPONSE: The statement referred to is not intended to convey such a meaning. It is intended to convey that the program is in compliance with applicable laws and regulations.

Commentor No. 242

COMMENT: APHIS research and development is not meeting the current needs for operational animal damage control. Vertebrate pesticides have been lost, others are in jeopardy and few new ones have been registered. Private industry has generally been unwilling to register vertebrate pesticides because of low return on investment for products that are essentially minor use. APHIS must expand its role in research and development of animal damage control methods and particularly, vertebrate pesticide registrations.

RESPONSE: Pesticide registrations are maintained by the DWRC within the constraints of appropriated Federal funding. The program does its best to maintain current registrations and obtain new registrations for vertebrate pesticides, where applicable.

Commentor No. 244

COMMENT: On page 2 of the Summary Introduction under Field Crops, prairie dogs should be excluded. Prairie dog problems might occur on cropland but they are a rangeland problem not cropland.

RESPONSE: APHIS ADC commonly encounters prairie dog damage in both rangeland and cropland. Please refer to Table 3-2.

COMMENT: On page 7 in the last sentence at the end of the first paragraph and at the top of page 8 of the Summary under Target Species, the use of illegal methods among the producers seems to me to be more in use in those States with APHIS ADC programs than without those programs.

RESPONSE: APHIS has no information that correlates the presence of an ADC program with illegal activities.

COMMENT: On page 9 of the summary at the end of the fourth paragraph from the top of the page, this is a doubtful suggestion. A compensation program conducted so that awards were greater for producers who had in-place methods to avoid losses with lesser awards for those who did less to protect their property and no award for the very worse cases where the

producers through their lax management invited damage. I am sure the producers would provide more protection without a Federal service-type program than with one. The reader should be able to ask the question "how did the sheep producer in Kansas survive after 20 years without a Federal program?" They provide protection to their sheep which in turn greatly reduces predator losses.

RESPONSE: Such a compensation program may well work. Whether it would result in significant cost savings to the taxpayer is questionable, because an increase in program staff would appear to be necessary to monitor the complex requirements advocated by the commentor. Without a Federal program, producers alone would be responsible for addressing predator losses. The analysis in the EIS (see the Economic Impact Assessment in Chapter 4) suggests that there are several conditions under which this responsibility can be shared, either among producers or with organized programs such as the APHIS ADC program. The State of Kansas does provide technical assistance to producers.

COMMENT: On page 11, the last sentence, APHIS ADC is developing literature for livestock producers that encourages the use of animal husbandry practices and non-lethal damaged control activities. How are you going to convince your head personnel who are opposed to those ideas? Why are you taking so long to produce this literature when Kansas has produced such materials for more than 13 years?

RESPONSE: APHIS ADC personnel are committed to providing professional wildlife damage assistance appropriate to individual situations. This includes implementation or recommendations of integrated management strategies which may include the use of animal husbandry practices and nonlethal methods. As discussed in Chapters 1 and 2, resource management activities such as animal husbandry are typically conducted by the resource owner. APHIS ADC provides literature and other technical information regarding resource management and other options which may decrease or eliminate depredations. To provide the most current information, APHIS ADC has an ongoing program of literature development.

COMMENT: If after more than 22 years of field experience which involved inspection of actual sites of livestock losses due to predation on more than 3,500 farms and ranches in Kansas and then teaching the producers how to solve those problems, if I've learned only one thing, it is that producers can solve their own problems. We have good records that could be used to check that statement.

RESPONSE: Thank you for this information. APHIS ADC also strongly supports self reliance, and provides technical assistance toward that end.

Commentor No. 255

COMMENT: Losses to large predators such as cougars and bears are minimal and do not justify any control, while guard dogs are the best protection against coyotes.

RESPONSE: Losses to large predators are evaluated on a case by case basis. Absolutes, such as always exercising control or never exercising control, are not acceptable. APHIS ADC encourages the use of guard dogs, which in many cases provide excellent protection.

Commentor No. 257

COMMENT: The Draft EIS describes the Denver Wildlife Research Center (DWRC) as a development center for chemical control methods. However, the Draft EIS does not adequately explain DWRC's role in the overall APHIS ADC Program. What are DWRC's goals and objectives? What alternatives exist for reallocating DWRC's resources? What are the environmental impacts of operating this research facility? These questions and others need to be addressed.

RESPONSE: DWRC's role in the APHIS ADC program is explained in Chapter 2. Some of the potential impacts of DWRC operations are addressed in the Economic Impact

Assessment in Chapter 4. Chemicals used by DWRC in 1988 are listed in Appendix K. Standard operating procedures for research appear in Chapter 5. DWRC research activities are planned, analyzed, and documented as required by NEPA, CEQ, and APHIS regulations.

COMMENT: Many of the environmental impacts identified are highly speculative in nature. These largely unknown impacts should be identified by substituting the term "may" for the word "would" wherever those impacts are described.

RESPONSE: The analysis of potential environmental impacts contained in the document are based on recognized impact assessment methods. Discussions of environmental impacts in the EIS have been reviewed to assure that they are qualified appropriately. The action is only "proposed" until a final decision is made.

Commentor No. 284

COMMENT: On page 1, Chapter 4, it is stated that impacts on humans are considered important if they affect the health and safety of one or more individuals. However, impacts on plants or animals are generally considered in terms of the effects on populations, species as a whole, communities or ecosystems. This statement means you are not undertaking an analysis of the environmental consequences of APHIS ADC programs on a level playing field.

RESPONSE: The perspective taken in the document is commonly taken in ecological analysis and in human health and safety assessment.

Commentor No. 293

COMMENT: You are required to consult with the responsible State agency, but we do not see this provision in your statement.

RESPONSE: APHIS agrees. Chapter 1 (see p. 1-18), and Chapter 2 (see p. 2-30) identify APHIS ADC responsibilities and initiatives with respect to consultation with State agencies.

Commentor No. 296

COMMENT: Appendix H - We are concerned that APHIS ADC activities are in compliance with the Migratory Bird Treaty Act and the conventions it implements. The APHIS ADC should ensure that no species protected by these international agencies are taken by this program.

RESPONSE: As is noted in the EIS, APHIS ADC complies with the Migratory Bird Treaty Act and other applicable laws, regulations, and permits.

Commentor No. 305

COMMENT: To say that your agency is concerned with endangered species is almost laughable.

RESPONSE: The USFWS Biological Opinion (see Appendix F) recognizes that APHIS ADC plays a positive role with regard to threatened and endangered species.

Commentor No. 311

COMMENT: Clearly there is a need for greater scrutiny of APHIS ADC activities. This draft is a good beginning and I hope the final EIS will be a fair response to the criticism that is being raised.

RESPONSE: Thank you for your comment. The National Animal Damage Control Advisory Committee, composed of individuals representing segments of the public with in interest in the program, will continue to "provide scrutiny" of program operations and assessment.

Commentor No. 313

COMMENT: Page 26 - Wyoming - The grizzly bear should be acknowledged in this section as a threatened species in the lower 48 states under the Endangered Species Act. The term "trophy game" does not seem appropriate to apply to a species with such Federal status. Discussion of the Wyoming landowner compensation program should more appropriately refer to categories such as ungulates, large carnivores, waterfowl, and sage grouse when talking about species that could cause compensable damage.

RESPONSE: The classification does not originate with APHIS ADC, but with State law.

COMMENT: Chapter 4, p. 4 discusses species diversity, habitat quality, and isolated populations. The document could be improved by linking these discussions to an assessment of each alternative.

RESPONSE: Such an evaluation is included for each alternative.

COMMENT: Page 66 - Paragraph 5 California clapper rail should be changed to "light-footed clapper rail." Animal Damage Control has an active red fox removal program at the Seal Beach National Wildlife Refuge, California, to protect the light-footed clapper rail.

RESPONSE: Thank you for this clarification. The correction has been made.

COMMENT: Page 78 - Sociocultural Impact Assessment. This section would benefit from a discussion of the ethical and environmental consequence of the APHIS ADC's current support of private game ranches. As stated on page 70, wildlife is a publicly owned resource in the United States, yet the right to hunt that resource is frequently reserved to the landowners, their kin, and paying customers. The sociocultural ramifications of providing public assistance through APHIS ADC to kill predators so that private individuals may sell the right to kill more game animals should be addressed. The value of this assistance to private individuals and the consequent risk to nontarget, nongame, and/or endangered species, all of which are publicly owned resources, should be discussed.

RESPONSE: Private game ranching is permitted in some States, particularly Texas, and is regulated by State wildlife management agencies. On such ranches, protection of game species from predators is a proper wildlife management practice. Most APHIS ADC activity to protect wildlife on game ranches involves exotic species that are owned and managed like domestic livestock. The environmental impacts of APHIS ADC activities to protect exotic species in general do not differ from those involved in protecting domestic livestock and are described adequately in this EIS.

Commentor No. 325

COMMENT: All predator control funds should be appropriated at both the Federal and State level, with no funding from private interests. This would ensure that all funding would be subject to scrutiny by Federal and State elected officials, and would allow citizens review and input in decisionmaking.

RESPONSE: Private organizations can play an important role in wildlife damage control. All APHIS ADC activities, including those relating to predator control, are subject to review by appropriate Federal, State and local regulatory agencies.

Commentor No. 327

COMMENT: Asserting that control methods may be in excess of what is necessary under a No Action Alternative (p. 2-23) disregards the fact that under the Current Program Alternative, control methods have historically been in excess of what is necessary.

RESPONSE: The analysis recognizes that excess use of control methods has occurred in the past. However, such excess use of control methods does not accurately characterize the Current Program.

COMMENT: On page 3-13, APHIS ADC asserts that "drought years may aggravate some predation problems." How does APHIS ADC incorporate natural climatic fluctuations into its control activities?

RESPONSE: The APHIS ADC program responds to damage on an as needed basis. Fluctuations in predation rates will affect the level of need. The level of effort needed is generally limited to the minimum necessary to control losses.

Commentor No. 334

COMMENT: The DWRC through the Pocatello Supply Depot (PSD), maintains and supports rodenticide bait registrations for baits prepared by PSD and made available for use by growers, producers or other agencies involved in vertebrate pest management. The amount and kinds of the various materials provided by PSD should be included in the EIS.

RESPONSE: This information for FY 1988 appeared in the DEIS, Table 4-4, and is included in the EIS, Table 4-6.

COMMENT: Many of the control items and baits are presently available only through PSD of the APHIS ADC program. Many private and State agencies bait and pesticide formulators also rely on the APHIS ADC's data for supporting EPA and State registrations of rodent baits. The vertebrate pest management expertise within the Denver Center is without question among the best in the world. Thus the loss of the Federal ADC program would have more far-reaching economic implications than the DEIS indicates.

RESPONSE: The comment is correct. The revised economic analysis reflects this.

COMMENT: In Chapter 4 on page 74 under the heading "Program Functions Assumed by Individuals and Private Organizations," the section implies or outright states that if anyone else conducted animal damage control, except the Federal ADC group, it would probably be done illegally or chemicals would be misused. Such strong condemnation of others (both professionals and non-professionals) conducting vertebrate pest management seems without good foundation especially since far more animal damage control is currently conducted nationally by others than is conducted by the APHIS ADC program. Since most of the toxic pesticides used in animal damage control are restricted use materials, safeguards are built into their uses. If good data exists to support this point-of-view, it should be cited.

RESPONSE: The passage referred to points out that strong incentives would exist for individuals to undertake vertebrate pest control, and that enforcement of use safeguards would be difficult. The provision of direct control and technical assistance is conducted by professionals in accordance with standard procedures. Without professional oversight and the existence of standard operating procedures, the potential for adverse impacts appears to be increased. When professionals conduct direct control or provide technical assistance, potential impacts may be avoided or mitigated by the knowledge and skill of the applicator and the use of approved procedures and management practices.

COMMENT: In Table 3-1, it should be made clear for each State as to whether direct control or technical assistance or both were provided. Without this, the table has little meaning.

RESPONSE: In most cases, both direct control and technical assistance are provided. The table is intended to demonstrate the variability of wildlife damage problems for which APHIS ADC is requested to provide assistance.

Commentor No. 361

COMMENT: Rework the Literature Cited (Appendix A) section into a form consistent with the majority of journals and guides within which we operate (e.g., Journal of Wildlife Society or Council of Biological Editors [CBE] Manual). The present citations do not conform with either of these standards.

RESPONSE: The format of Appendix A conforms to Government Printing Office style required by USDA.

Commentor No. 449

COMMENT: APHIS ADC should be the vanguard of leadership for the coexistence of all nature species on this continent, not the eradication of those that do not fit the rampant desires of European invaders.

RESPONSE: The APHIS ADC program does not promote or support species eradication. Eradication is a minor but important aspect of wildlife image management. (See p. 4-52 and comment on 1350.)

Commentor No. 466

COMMENT: On page 4-1, the DEIS states that "The conclusions presented in this analysis are intended to guide decision makers in selecting the preferred alternative for the APHIS ADC program" (you said it, not me!). It also states that changes of the DEIS, once the public comments are received, will be "incorporated as appropriate in the FEIS. Who deems what is "appropriate"? and what about the public voice as being "one voice - one vote?" The decision seems made, why all the paper? This I strongly protest.

RESPONSE: The passage on 4-1 referred to in the comment misworded the program's intention to state that the analysis would be used by the decisionmaker to select an alternative for implementation. The EIS has been changed accordingly. Similarly, the intent of the word "appropriately" was to convey that the appropriate response would be provided as defined by 40 CFR 1503.4(a).

Commentor No. 469

COMMENT: The revised draft should incorporate within new alternatives the notion of acceptable losses with respect to migratory birds. Under the Migratory Bird Treaty Act, responsibility for the protection of migratory birds rests with the Federal Government. So, when necessary, does the control of damage caused by migratory birds. Damage caused by migratory birds must, as with wildlife-caused damage on public lands, be subject to a different set of standards that takes into account the protected status of these birds and the strong interest of the public in their preservation and management.

RESPONSE: The "acceptability" of losses is highly variable, and may differ dramatically with each situation. Regulatory management of migratory birds rests primarily with the Federal government and is shared with State wildlife management agencies to various extents. APHIS ADC is the Federal agency responsible for providing for migratory bird damage management. APHIS ADC shares this responsibility with State wildlife management agencies. To conduct control activities, APHIS ADC must obtain and abide by permits issued by USFWS. In an operational sense, such permits define the notion of "acceptable loss" for each situation. APHIS ADC activities are conducted in compliance with applicable Federal, State, and local laws and regulations concerning the protection of migratory birds. This fact is noted in the discussion of "Authorities" in Chapter 1 of the EIS.

Commentor No. 473

COMMENT: There is absolutely no reason for the Federal government to be killing roadrunners, grebes, hawks or other federally protected birds.

RESPONSE: Most wildlife species cause damage in some situations. The USFWS provides for these situations in regard to federally protected or regulated species through the issuance of bird depredation permits. APHIS ADC of Federally protected bird species complies with USFWS regulations.

Commentor No. 517

COMMENT: No longer should the coyote be the scapegoat, coyotes, deer, and antelope (and wolves historically) have coexisted for years.

RESPONSE: As documented in the EIS, coyotes are responsible for substantial damage to agricultural crops and livestock. APHIS recognizes that many additional sources of mortality impact livestock. In some areas, human activities have contributed to a severe decline in the population levels of pronghorn antelopes or restriction of their habitat. In these areas, coyote depredation can dramatically impact antelope survival. Some wildlife management agencies have requested assistance from APHIS ADC to control coyote depredation in some of these areas.

Commentor No. 836

COMMENT: Concern was expressed over the impression being created by "anti's" that mountain lion populations in the west are in a threatened or endangered situation. A request for help was made of State Wildlife Agencies to overcome this impression. There is need to set the record straight.

RESPONSE: In general, mountain lion populations in the West are not threatened or endangered.

Commentor No. 909

COMMENT: The Final EIS must correct the inaccurate representation of Wisconsin's WDP compensation program. On pages 25 and 26 of EIS Chapter 2 there is an explanation of the compensation portion of Wisconsin's WDP. Some discrepancies do exist. In EIS Chapter 2, page 26, paragraph 2, 3rd sentence the EIS explains that the WDP was implemented in 1987. The WDP was implemented by WDNR and participating counties in 1984. APHIS ADC subcontracting began in the fall of 1986, and became fully operational in 1987. The WDP was in operation 3 years prior to APHIS ADC's involvement.

In EIS Chapter 2, page 26, paragraph 1, 6th sentence the EIS states that Wisconsin paid 32% of actual value of deer losses to agricultural crops in 1988. Again in EIS Chapter 4, page 92, paragraph 5, 6th sentence, the EIS states Wisconsin "paid 32% of the actual value of deer, bear and goose damage to agricultural resources in 1988." Both statements are inaccurate. In 1988 total assessed damage claims reported for payment in Wisconsin's WDP totaled $1,131,310.90. Of this, the deer portion was $1,016,512.10, or 90% of the total. Because 56 of these deer claims exceeded the maximum $5,000 allowable claim, the claim amount eligible for payment after a $500 deductible resulted in a total of $716,674 worth the eligible deer claims. However, since administrative and abatement costs are deducted from the budget first only $622,175.40 worth of deer damage claims could be paid out of the total claim budget of $691,306. This results in payment of 61% of total reported deer damage in 1988 not 32% reported in the EIS Chapter 2.

RESPONSE: Thank you for this clarification. The correction has been incorporated in the EIS.

COMMENT: It is probably an accurate portrayal of APHIS ADC emphasis that western APHIS ADC operations are underscored in this draft EIS. The Eastern Region provides a greater proportion of the funding and has a proportionately greater amount of the Nation's agricultural Gross National Product than is reflected in the dispersal of APHIS ADC regional budgets. The EIS should express a greater representation of APHIS ADC's Eastern Region activities.

RESPONSE: The commentor is referred to the Economic Impact Assessment in Chapter 4 of this EIS. This revised assessment provides an expanded description of the economics of the APHIS ADC program and the impacted agricultural resources. The distribution of program resources and activities is based on requests for program services, extent of damages, and the availability of resources at the Federal, State and local level.

Commentor No. 947

COMMENT: The FEIS needs to re-examine what DWRC is now, what it needs to be, what its role in the overall program should be and what its goals and objectives should be over the long-term for APHIS ADC to have a comprehensive program. It also needs to review the potential for support of research needs in wildlife damage prevention and control by the Land Grant Universities across the nation.

RESPONSE: The focus of the EIS is on potential environmental impacts. Examination of the role of DWRC now and in the future is a strategic planning task.

COMMENT: The whole EIS should focus on prevention as one of the critical methods for reducing wildlife damage. The flow charts used in several places need to emphasize prevention and evaluation as steps and pathways to decision-making.

RESPONSE: Prevention of damage, as well as minimizing or stopping existing damage, are critical factors in wildlife damage management decisionmaking. The APHIS ADC decision model described in Chapter 2 shows the variables involved in formulating and selecting appropriate management strategies.

COMMENT: The DEIS states that its programs are available to all citizens, then in the next sentence emphasize that its efforts are largely directed toward cooperative, cost-shared activities. The language in the 1931 Act says only "may cooperate."

RESPONSE: Cost-sharing is not a requirement for receiving assistance from APHIS ADC. However, cost share funds are a significant portion of program funding in most States. APHIS ADC programs are based on several sources of funding.

Commentor No. 1022

COMMENT: Since our previous submission, the planned skunk fertility control project mentioned at that time, has been successfully carried out. Two short articles on the use of Norplant implants are attached. Fertility control of raccoons is being planned. Research at American Universities is planned or underway in this field. A system of control for feral cats, developed by the Universities Federation for Animal Welfare was also mentioned.

RESPONSE: APHIS ADC has reviewed the articles. Thank you. The role of contraception is being evaluated and will be used as appropriate.

COMMENT: The National Animal Damage Control Advisory Committee includes only one representative of an animal welfare organization and one environmental representative. The bulk of the membership represents sheep producers. To date the Committee has served principally as an avenue for livestock interests to urge maximum killing of animals.

RESPONSE: The National Animal Damage Control Advisory Committee represents varied interests, as required by its charter.

Commentor No. 1024

COMMENT: As currently done in Utah, we believe a "head tax" should be charged for all head of livestock on a national scale.

RESPONSE: Thank you for your comment.

Commentor No. 1044

COMMENT: This draft has done an excellent job of addressing the activities of ADC APHIS, but we feel there is a need to indicate more clearly that it does not address all the important vertebrate pest problems and the control in the United States. For example, APHIS ADC is involved with only a small fraction of the vertebrate pest problems experienced in California agriculture, aquaculture, forestry and the urban environment. APHIS ADC responsibility in each State is negotiable and changes constantly. This concern could possibly be addressed in more detail in the opening summary under Resources Protected and again in Chapter Five under the Current Program.

RESPONSE: The commentor is correct that APHIS ADC responsibility in each State is negotiable. This fact is noted in the EIS.

Commentor No. 1350

COMMENT: On page 4-32, we are told "Eradication of a local population may be a desirable goal to protect other wildlife species, public health and safety or other resources." I fail to see how changing the inner workings of an ecosystem which has been evolving for billions of years could possibly be good for any of the involved species.

RESPONSE: In general, APHIS ADC agrees with this comment. However, the cited passage describes eradication of the Arctic fox from Kiska Island to protect the Aleutian Canada goose. This management action took place on an island ecosystem that had evolved without the Arctic fox, and eradication of the introduced foxes was deemed appropriate to protect the endangered Aleutian Canada goose and other ground nesting birds. APHIS ADC does not support eradication efforts as a routine response to wildlife damage problems.

Commentor No. 1365

COMMENT: On page 11 of Chapter 2 in the second-to-the-last paragraph, the Forest Service is referred to as USDA U.S. Forest Service and abbreviated USFS. The Forest Service should be identified as USDA, Forest Service.

RESPONSE: The correction has been made.

COMMENT: In Chapter 4, page 70, paragraph 5, the document states that without APHIS ADC "...the USDA Forest service would be forced to revert to the use of herbicides." Although the Forest Service may choose herbicides as the vegetation management tool of choice for particular situations, the agency would not be "forced" into that decision as there are a variety of vegetation management alternatives available for most situations.

RESPONSE: This section has been rewritten.

COMMENT: The Pocatello Supply Depot is mentioned in the DEIS, but there is no explanation as to its relationship to the APHIS ADC Program or any information regarding its function.

RESPONSE: The structure and function of the Pocatello Supply Depot is described in Chapter 2, page 36.

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L Appendix

Table L-1. Index to Commentors on the Draft Environmental Impact Statement and the Supplement to the Draft Environmental Impact Statement

The names of individual commentors on the Draft Environmental Impact Statement (DEIS) and the Supplement to the Draft Environmental Impact Statement (SEIS) are listed alphabetically, followed by the letter number. Where last names are duplicated, initials and state of residence (if available) are indicated. Comment letters from government agencies, private organizations, and universities are listed alphabetically by name of organization.

Individual Commentors to the DEIS

Name	Letter Number	Name	Letter Number	Name	Letter Number	Name	Letter Number
Abelson	1189	Atherton	103	Bergman J	757	Buck	1283
Abrahamson	751	Aulkowsk	572	Bergoffen	1350	Buckna	596
Achen M	270	Avery	1072	Bergquist	845	Budagher WJR	1387
Achen	286	Babel	1141	Bernard	97	Budagher RD	1389
Achen TK (NM)	287	Baca	768	Bert	728	Budagher D (NM)	1396
Achen J (NM)	448	Bacher	189	Best JC	727	Budagher W	1398
Ackerman	742	Back	513	Best BO (NM)	810	Budagher MR	1399
Adams B (TX)	389	Baco C	711	Beyer	558	Buffett	1227
Adams CE (KY)	1049	Baco S (NE)	1234	Biltoft	290	Bullock	754
Adshead	185	Bacon	1300	Birn	88	Bunkman	676
Agiiero	408	Bailey	1093	Bishop C (CO)	1047	Bunyard	16
Aguilar	830	Bain	1070	Bishop L (CO)	1192	Buol JA	875
Aguirre	403	Bainbridge LK (CA)	83	Blackwelder	502	Buol	958
Allen	1054	Bainbridge G (CA)	280	Blan	1162	Burdick	724
Allen (VT)	1191	Baker D (NM)	553	Blythe	1106	Burghart	894
Alley	862	Baker AL	1043	Boca	712	Burks	826
Allsup	531	Ball	902	Bogle	759	Burns R (NM)	15
Alobaidi	460	Bamford	899	Bohart	922	Burns J (CO)	1239
Alouso	974	Banks	53	Bolsover	481	Burton	180
Ament	884	Barker	636	Bolton	1290	Bushnell	515
Anderson C	19	Barkley	1226	Bonham	1139	Butterfield	1117
Anderson DC (CA)	370	Barnetson	600	Bostron DO	883	Cable	1203
Anderson K (CA)	457	Barnhart	68	Bostron H (CO)	1352	Cachman	1183
Anderson FA (PA)	569	Barrera	589	Boswell JW	679	Caldwell	854
Anderson AS	693	Barrett B	689	Boswell	695	Calhoun	1077
Anderson S (NM)	722	Barrett K	702	Boswell	1367	Callegos	798
Anderson P	760	Barton	1318	Boudreaux	495	Campbell A (CA)	65
Anderson RO	781	Bauer D	868	Bowler	48	Campbell KJ	700
Anderson DD	860	Bauer E	869	Boyle JL	348	Campbell R (CA)	936
Anderson D (CO)	885	Bauer KA	1285	Boyle S	1157	Caperton	202
Anderson JA	1030	Baxter	1246	Brady	1038	Card	345
Anderson TS (OR)	1176	Bays	1128	Bragg E	704	Carlton	366
Anderson KL (MA)	1187	Bear J (CA)	526	Bragg B	717	Carpenter PF (CA)	129
Anderson KA (MN)	1321	Bear ML	1166	Bramble	150	Carpenter G (TX)	1356
Anderson J	1343	Bearden	1115	Brandes	376	Carr	516
Anderson-Varney	625	Beattie	627	Breinholt	116	Carroll (CA)	69
Andiade	55	Beck	231	Brewton	1354	Carroll MH (NM)	561
Anson	187	Beers	900	Bride	559	Carrothers	912
Antiveros	1000	Bell	1067	Brinkman	784	Carson	1092
Apanaitis	472	Belo	1074	Brothers	926	Carter	99
Apple	18	Benavides	385	Brotherton	5	Carter FC	373
Aragon	507	Benedetti	886	Brown	49	Casabonne M	303
Armstrong	1364	Benedetto	1357	Brown M.	335	Casabonne ME	992
Arnold	950	Berg	63	Brown P (VA)	1307	Casabonne	1064
Ashley E	696	Berger	492	Bryan	1251	Casaday	1351
Ashley Evelyn	795	Bergman RL	691	Buchanan	833	Case	1082

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Chamberlain	441
Chaney	51
Chapa	426
Chaplick	505
Chapman	289
Chase	631
Chastic	1209
Chauon	783
Cheding	1155
Cheney	1278
Chinn	380
Chojnacky	310
Chrisman	683
Christen	1359
Christensen BG	948
Christensen FC	1052
Christese	1358
Chu	358
Chupe	438
Clardy	1270
Clark NC	484
Clark WTJr	687
Clark S	701
Clark	777
Clark (MO)	1314
Clement	820
Clements L	802
Clements T	616
Clements JLS	714
Cleveland	750
Close	1033
Cockrell	622
Cohen	360
Coleman	716
Collier	1388
Collins ML	864
Coluze	1319
Condon	911
Condoret	949
Conduft	617
Cone	1131
Connery	381
Cook	506
Cooke	1121
Cooper	877
Copeland	1079
Corbin	1180
Cordova	1397
Corn	806
Cornell	1221
Corning	93
Correl	1014
Cortez	384
Coughlin	45
Coupland	1156
Cox LM (WA)	527
Cox	1102
Crane	1292
Cravey	934
Creamer L	1061
Creamer	1062
Crockett	301
Crosby	1231
Crutchen	1281
Cuez	394
Culberson	1125
Cumine	933
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Dalton L	721
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Dankwort	337
Dannen	1223
Danser	30
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Daugherty	1447
David	268
Davis E	271
Davis JD (TX)	582
Davis RE	961
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Davis K (CO)	1310
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De Bolt	486
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De La Garza	391
De Nisca	1184
De Priest	503
De Soto	889
Dean L	639
Dean D	668
Dean B	720
Deerman	1099
Demetroff	1081
Demy	1123
Derfuss/Denslow	566
Deteraling	890
Dickard	124
Dieffenbach	1386
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Dixon T (CO)	1194
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Dosch	835
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Burke	Humane Society of Santa Clara Valley	952
Hagood	The Humane Society of The U.S.	469
Mentley	Humane Society of the Willamette Valley	920
Glenn	Idaho Cattle Association	330
Jayne	Idaho Environmental Council	281
Bivens	Idaho Farm Bureau Federation	546
Siddoway	Idaho Wool Growers Association	364
Brim	State Of Illinois Dept. Of Agriculture	328
Frech	Illinois Department of Conservation	1335
Clendenin	Indiana Sheep Breeders Association	964
Whitaker	Institute of Animal Protection	40
Berryman	Intl. Assoc. Of Fish And Wildlife Societies	374
Peterson	Intl. Assn. of Fish and Wildlife Agencies	733
Boswell	Iowa Dept. Of Agriculture And Land	32
Jacobson	Jacobson & Jacobson	190
Van Horn	Junior Humane Society	62
Henderson	Kansas State University	244
Wentz	Kansas Wildlife and Parks Commision	896
Pearson	Lea County Cattle Grower's Association	266
Sickle	State Of Louisiana	212
	Marion County Humane Society	497
Parkhurst	University Of Massachusetts	361
Reisig	Michigan Cattlemen's Association	966
Holmes	State of Minnesota	1349
Boswell	Mississippi Animal Rescue League	946
Freiling	Missouri Chapter Of The Wildlife Society	350
Glaser	Missouri Department Of Conservation	128
Wells	Montana Dept of Fish Wildlife & Conservation	624
Enkerud	Montana Stockgrowers Association	445
Gilbert	Montana Wool Growers Association	169
Snortland	State Of Montana	242
Henderson	National Audubon Society	344
Lyons	National Audubon Society	473
Turner	National Audubon Society	479
Neal	National Cattlemen's Association	1347
Wootten	The Native Plant Society Of New Mexico	293
Wald	Natural Resources Defense Council	468
Bailey	Nebraska Game And Parks Commission	11
O'Brien	State Of Nevada	3
Heinrich	New Jersey Farm Bureau	294
Montoya	State of New Mexico	953
Eppers	New Mexico Cattle Grower's Association	100
Mcilhaney	New Mexico Farm And Livestock Bureau	96
Caudill	New Mexico Wildlife Legislative	324
Lewis	New Mexico Wool Growers Inc.	184
White	New Mexico State University	354
Moser	North Dakota Stockmen's Association	514
	The Northeast Environmental Center	1023
Eitelgeorge	North Central Ohio Nature Preservation League	477
Lewis	Oklahoma Dept. Of Wildlife Commission	470
Rill	Oregon Sheep Growers Association	225
Pupin	Otero Hunting & Ranching Association	650
Sturla	Peninsula Humane Society	1048
Newkirk	People For The Ethical Treatment Of Animals	241
Neal	Public Lands Council	1348
Tweit	R&J Associates	9
Briggs	Rachel Carson Council Inc.	210

Name	Organization	Letter Number
Edington	Rancho San Benito	1050
Oyler	The Rio Grande Chapter of The Sierra Club	256
Mackler	San Diego Animal Advocates	318
Lindblom	Scandinavian Design	232
Mcteer	Sc Wildlife & Marine Resources	66
Struffenegger	Sea Farm Washington Inc.	47
Mannchen	Sierra Club	98
Royder	Sierra Club	20
Young	Sierra Club(Atlantic Chapter)	237
Vaught	Sierra Club California	333
Gregory	Sierra Club (Grand Canyon Chapter)	247
Stevens	Society for Animal Protective Legislation	1022
Larson	Soil Conservation Service	50
Clarkson	South Dakota Sheep Growers	28
Rait	Southern Utah Wilderness Alliance	327
Sauber	Southwestern New Mexico Audubon Society	517
Meister	Texas Farm Bureau	211
Owen	Texas and Southwestern Cattle Raisers	519
Russell	Tucson Audubon Society	311
Horn	USDA Forest Service	315
Ketcham	USDA Forest Service	1365
Hobson	USDA Soil Conservation Service	547
Deason	U.S. Department Of The Interior	313
Le Boeuf	U.S. Department of Transportation	543
Sanderson	U.S. Environmental Protection Agency	1361
Buchi	The University Of Utah	439
Macfarlane	Utah Wilderness Association	362
Gunther	Various Products	591
Van Zandt	State Of Vermont	105
Gillespie	State Of Washington	87
Gilbert	Washington State University	1
Brewer	Washington Wool Grower Association	739
Besadny	State of Wisconsin	909
Mabbott	Wild Allan Mountain	252
Jahn	Wildlife Management Institute	257
Hodgdon	The Wildlife Society	1026
Loosli	The Wildlife Trust	233
Lundgren	Women's Auxiliary SD Sheep Growers	849
Bourret	Wy Farm Bureau Federation	39
White	Wyoming Game And Fish Department	454
Paseneaux	Wyoming Wool Growers Association	619
Umphres	Zapata County Nature Conservation Society	304

Organizational Commentors to the SEIS

Name	Organization	Letter Number
MENDEL	Albuquerque Wildlife Federation	000018
NEWPHER	American Farm Bureau Association	000062
ZIERENBERG	Animal Damage Review	000095
WHITAKER	Animal Protection Institute	000012
ROBERTS	California Farm Bureau	000083
BERDE	Carson Forest Watch	000044
HAGEDORN	Committee for Idaho's High Desert	000087
FARMER	Consolidated Woolgrower's Assoc.	000049
MILLER	Cooperative Extension Service	000042
BEAR	Council on Environmental Quality	000102
LADD	Coyote Gulch Productions	000022
SANDERSON	Environmental Protection Agency	000104
WOLFF	Forest Guardians	000064
STANFIELD	Friends of the Bow	100103
SHUBERT	Fund For Animals	000098
EWING	Georgia Farm Bureau	000097
GRANDY	Humane Society of the United States	000092
JAYNE	Idaho Environmental Committee	000007
PLAGGE	Iowa Farm Bureau	000065
WRISTON	Mesa Co. Woolgrower's Association	000014
PALMER	Mountain Lion Foundation	000089
BAKER	National Rifle Association	000073
DOUGHERTY	National Wildlife Federation	000079
WOOTEN	Native Plant Society of NM	000028
WHITE	New Mex. Department of Agriculture	000038
VAN SWEDEN	New Mexico Farm Bureau	000070
PETERSON	New Mexico Natural History Institute	000020
HUMPHREY	Oregon Wildlife Federation	000037
SHAFER	Pennsylvania Farm Bureau	000084
HENTHORNE	People for Ethic. Treat. of Animals	000094
GRUBBS	Predator Project	000100
HOLT	Public Health Service	000009
BEDNER	Rio Grande Sierra Club	000019
HELD	South Dakota Farm Bureau	000078
RAINES	Southern Utah Wilderness Society	000101
FRANKLIN	The Wildlife Society	000093
CARPENTER	Texas Agriculture Extension Service	000085
HOWARD	Texas Animal Damage Control Assoc.	000090
PFLUGER	Texas Sheep and Goat Raiser's Assoc.	000091
DEASON	U.S. Department of the Interior	000086
WALLENTINE	Utah Farm Bureau	000061
SPARROWE	Wildlife Management Institute	000077
BOURRET	Wyoming Farm Bureau	000040

Table L-2. Index of Consolidated Comments and Commentors

COMMENT	COMMENTORS (Listed by letter number)								
1. Wildlife should not be killed by a Federal Program.	4	109	192	272	451	520	933	1382	000103
	23	112	207	279	452	524	945	1384	
	25	121	217	284	453	529	947	000001	
	26	132	223	290	456	555	955	000007	
	57	135	227	295	460	564	969	000022	
	58	140	232	319	467	577	1033	000024	
	61	153	237	325	472	621	1047	000027	
	64	154	243	338	473	735	1338	000039	
	81	155	251	342	475	748	1350	000054	
	93	168	259	351	483	855	1362	000072	
	98	178	262	373	494	888	1365	000088	
	102	187	264	376	517	900	1374	000089	
	107	188	271	380	518	929	1376	000102	
2. APHIS should prepare another Draft EIS.	14	453	535	599	892	1185	1222	1259	1316
	40	463	536	600	893	1186	1223	1260	1317
	52	466	537	601	897	1187	1224	1261	1318
	88	467	538	618	903	1188	1225	1262	1319
	98	468	540	621	907	1189	1226	1273	1320
	119	469	541	623	914	1190	1227	1274	1321
	144	472	545	625	920	1191	1228	1285	1322
	161	474	549	627	932	1192	1229	1286	1323
	195	477	550	644	933	1193	1230	1287	1324
	206	487	551	645	945	1194	1231	1288	1325
	228	488	554	646	946	1195	1232	1289	1326
	234	489	556	647	952	1196	1233	1290	1327
	237	496	557	648	960	1197	1234	1291	1328
	238	497	558	649	962	1198	1235	1292	1329
	240	498	559	651	965	1199	1236	1293	1330
	248	499	562	653	1025	1200	1237	1294	1331
	255	502	563	657	1040	1201	1238	1295	1333
	257	503	564	658	1047	1202	1239	1296	1344
	268	504	565	730	1048	1203	1240	1297	1345
	275	505	566	734	1049	1204	1241	1298	1346
	285	508	567	737	1050	1205	1242	1299	1350
	290	510	568	741	1053	1206	1243	1300	1363
	291	511	569	742	1136	1207	1244	1301	1368
	293	513	570	746	1159	1208	1245	1302	1382
	298	515	571	747	1172	1209	1246	1303	1384
	310	516	572	748	1173	1210	1247	1304	1390
	321	518	573	750	1174	1211	1248	1305	1393
	332	520	574	751	1175	1212	1249	1306	000079
	348	521	575	752	1176	1213	1250	1307	000088
	351	522	582	753	1177	1214	1251	1308	000092
	353	523	583	796	1178	1215	1252	1309	000098
	356	524	585	825	1179	1216	1253	1310	
	362	525	591	829	1180	1217	1254	1311	
	365	527	594	838	1181	1218	1255	1312	
	367	528	595	845	1182	1219	1256	1313	
	379	530	596	848	1183	1220	1257	1314	
	380	534	597	887	1184	1221	1258	1315	
3. The DEIS does not adequately describe the purpose and need for the ADC Program, nor does it adequately describe the current ADC Program.	18	237	324	733	000011				
	40	238	332	853	000020				
	52	240	334	896	000023				
	61	247	355	947	000041				
	97	248	362	967	000079				
	98	255	365	968	000081				
	119	257	380	1022	000086				
	126	275	396	1023	000087				
	134	281	447	1024	000088				
	161	285	449	1026	000092				
	174	291	469	1044	000095				
	221	298	552	1379	000102				

4. The draft EIS does not present an adequate number of reasonable altrenatives to the current program. The alternatives are not analyzed adequately. The analysis is biased toward the preferred alternative. Or, the Supplement does a good job of presenting and analyzing alternatives.	11	211	293	463	960	000024			
	14	215	298	465	1022	000025			
	24	221	306	466	1023	000039			
	29	237	308	468	1024	000042			
	31	238	313	469	1025	000047			
	40	240	324	470	1026	000064			
	52	241	327	480	1048	000079			
	62	244	329	490	1349	000080			
	63	245	332	547	1363	000081			
	98	246	336	548	1367	000086			
	105	247	343	553	1368	000087			
	114	255	346	554	1379	000088			
	117	256	356	733	1380	000092			
	121	257	357	896	1383	000102			
	134	259	362	920	1384				
	159	275	365	939	1385				
	162	281	371	945	000001				
	204	284	447	946	000007				
	206	291	458	947	000015				
	210	292	462	959	000023				
5. ADC did or did not adequately address NEPA requirements, process, and procedures, including distribution of the DEIS, length of comment period, and number and location of public hearings on the DEIS.	39	237	250	353	469	1350	000037	000098	
	98	238	275	354	969	000002	000064	000101	
	121	240	310	362	1024	000015	000088		
	225	246	327	450	1026	000019	000095		
6. APHIS should revise the EIS to include data for more years than FY 88 or use more specific data.	14	195	238	317	469	000022	000079	000089	000095
	121	275	313	325	1365	000044	000086	000092	
7. The DEIS did not give adequate consideration to cumulative impacts.	9	98	247	313	362	928	000025	000086	000102
	23	225	275	315	469	953	000036	000098	000103
	59	238	289	327	925	1023	000063	000100	
8. The DEIS does not adequately consider threatened and endangered species. The USFWS Section 7 Biological Opinion must be in the DEIS or must be available for the public review and comment.	9	41	238	296	359	733	1023	000011	000064
	11	55	244	305	469	734	1024	000033	000079
	12	98	245	313	470	896	1370	000036	000095
	23	121	247	324	473	960	1379	000043	000096
	39	183	257	327	624	1022	000001	000063	000100
									000103
9. Mitigation measures proposed are inadequate. 000104	13	76	238	313	469	470	960	1024	000024
	23	98	245	324	324	733	1022	1370	000090
	30	138	275	350	350	896	1023	1379	000101
10. The ADC program should not be called an Intergrated Pest Management Program.	9	243	311	469	947	000011	000088		
	98	244	325	559	1023	000020	000092		
	221	310	327	946	1361	000039	000103		
11. The DEIS contains no description or analysis of ADC's control methods.	97	240	255	285	310	371	468	1365	000079
	98	248	257	290	314	380	552	000002	000081
	161	249	275	291	332	447	947	000011	000095
12. ADC control methods are not selective.	12	122	318	499	536	571	645	845	1159
	16	124	321	502	537	572	647	855	1273
	17	130	322	503	538	573	648	859	1333
	23	134	324	504	539	574	649	877	1344
	31	136	332	505	540	576	651	887	1345
	34	163	349	510	541	582	653	888	1361
	40	186	365	511	545	583	657	893	1368
	43	197	371	512	550	585	730	895	1384
	45	203	373	513	551	594	734	897	000012
	46	237	460	515	556	596	737	907	000024
	49	239	462	516	557	597	741	914	000037
	53	245	464	518	558	598	746	932	000082
	58	247	474	520	561	599	747	952	000088
	60	248	476	521	562	600	748	960	000096
	65	261	477	522	564	601	750	962	000102

	67	264	478	525	565	618	752	1022	000104
	70	276	489	527	566	621	753	1024	
	71	289	495	528	567	623	796	1048	
	80	290	496	530	568	625	825	1049	
	81	312	497	534	569	626	829	1050	
	98	313	498	535	570	644	838	1136	
13. The DEIS does not take into account cruelty of control methods and wildlife suffering. ADC should have to obey state humane laws. ADC methods are cruel and inhumane.	1	75	136	203	264	332	468	615	1024
	14	80	156	207	271	345	473	621	1048
	23	92	163	209	275	355	486	626	1053
	34	103	166	214	276	365	490	627	1151
	40	104	180	236	283	369	508	664	1159
	43	106	182	237	289	371	518	735	1273
	45	108	183	238	291	373	535	742	000011
	54	121	186	239	292	378	536	743	000016
	56	122	187	245	304	440	539	829	000024
	57	123	191	247	308	450	540	834	000031
	60	124	194	253	318	459	553	855	000067
	68	130	198	255	322	460	555	892	000088
	70	134	201	261	325	462	564	952	
	71	135	202	263	327	464	568	1022	
14. ADC's use of chemicals pose a risk to the environment and to human health and safety.	49	159	247	304	327	462	1024	1384	
	58	165	265	305	359	615	1361	000001	
	98	166	275	313	362	1022	1376	000043	
15. The accuracy of target and non-target take figures and the accuracy of population figures is open to question.	2	46	237	247	329	1024	1370	000079	000095
	11	59	238	284	362	1365	000011	000081	000096
	12	98	240	290	1022	1368	000044	000088	
16. ADC practices are not biologically or environmentally sound and they contribute to upsetting the balance of nature.	4	129	245	376	1172	1205	1239	1292	1326
	12	130	247	378	1173	1206	1240	1293	1328
	14	131	249	460	1174	1207	1241	1294	1329
	26	132	254	462	1175	1208	1242	1295	1330
	31	134	255	464	1176	1209	1243	1296	1331
	34	135	260	468	1177	1210	1244	1297	1346
	43	136	263	469	1178	1211	1245	1298	1368
	46	137	265	471	1179	1212	1246	1299	1374
	49	139	272	473	1180	1213	1247	1300	1376
	51	162	273	476	1181	1214	1248	1301	1382
	54	163	275	478	1182	1215	1249	1302	000001
	55	166	276	486	1183	1216	1250	1303	000005
	56	170	283	490	1184	1217	1251	1304	000011
	58	174	284	491	1185	1219	1252	1305	000012
	60	176	296	500	1186	1220	1253	1306	000013
	61	181	297	508	1187	1221	1254	1307	000020
	70	182	298	526	1188	1222	1255	1308	000024
	71	186	303	534	1189	1223	1256	1309	000027
	73	187	304	535	1190	1224	1257	1310	000044
	74	200	308	539	1191	1225	1258	1311	000063
	75	201	309	555	1192	1226	1259	1312	000076
	85	209	312	615	1193	1227	1260	1314	000079
	92	210	314	735	1194	1228	1261	1315	000080
	97	214	316	755	1195	1229	1262	1316	000082
	98	221	317	852	1196	1230	1274	1317	000095
	101	224	324	877	1197	1231	1283	1318	000096
	102	226	325	939	1198	1232	1285	1319	000100
	106	227	327	946	1199	1233	1286	1320	000103
	107	229	348	959	1200	1234	1287	1321	000104
	110	235	349	960	1201	1235	1288	1322	
	121	237	367	969	1202	1236	1289	1323	
	122	238	371	1024	1203	1237	1290	1324	
	127	240	373	1025	1204	1238	1291	1325	
17. The DEIS should assess the impacts of ADC activities at specific sites and locations, or use the ecosystem as the relevant unit of analysis.	39	98	247	325	344	947	1365	000104	
	66	237	275	327	466	1026	000079		
	91	240	313	334	468	1361	000100		

18. The scope of impacts considered in the DEIS is not correct.

11	218	247	292	327	479	953	1368	000017
12	230	257	296	344	494	960	1373	000027
61	237	275	310	361	544	1022	1374	000044
121	241	284	313	362	552	1024	000015	000098
161	244	285	324	469	925	1026	000016	000100

19. The Draft EIS ignores public lands issues that are the real problem with the ADC program.

4	161	277	460	537	623	1024
7	168	278	465	538	625	1033
12	170	285	467	539	644	1049
14	171	291	468	541	645	1050
16	175	298	469	545	646	1054
17	180	308	471	548	647	1136
23	183	310	472	549	648	1145
28	186	312	474	550	649	1265
30	188	313	477	551	651	1277
40	190	314	478	555	653	1336
46	191	320	481	556	655	1337
51	195	322	482	557	664	1339
52	197	324	483	558	730	1341
53	198	325	487	559	734	1344
54	199	327	489	562	737	1345
60	201	332	490	563	741	1346
61	205	333	491	565	743	1360
63	206	337	492	566	746	1379
64	207	341	493	567	747	1380
65	209	343	496	568	748	1384
67	215	344	497	569	750	000001
68	220	345	498	570	751	000007
69	223	348	502	572	752	000011
70	228	351	503	573	753	000024
71	233	356	504	574	796	000036
75	236	358	505	575	825	000039
81	237	362	510	576	829	000041
82	240	365	512	577	838	000044
83	241	366	513	578	845	000082
85	243	373	515	582	887	000089
92	245	376	516	583	892	000098
97	247	377	517	591	893	
98	248	379	518	592	895	
103	252	380	520	593	907	
116	254	439	521	596	914	
119	255	440	522	597	932	
122	256	449	523	598	933	
123	265	450	525	599	939	
127	269	453	526	601	949	
130	271	456	527	618	962	
131	273	457	528	620	965	
134	275	458	534	621	1022	
154	276	459	536	622	1023	

20. ADC has no way to monitor program activities or effectiveness.

97	237	248	290	310	346	469	939	1361
98	240	255	291	311	355	479	1022	1384
161	245	257	298	327	356	615	1024	000018
219	247	284	308	332	468	733	1026	000020
								000079
								000086
								000095
								000104

21. ADC is a subsidy to livestock producers. Beneficiaries of ADC activities should bear the cost of the program. Producers should consider predation losses a normal cost of doing business and should ensure themselves against animal loss. They could also pass along to the consumer.

9	163	276	376	655	1182	1210	1238	1285	1313	000024
23	165	277	377	656	1183	1211	1239	1286	1314	000025
31	166	278	378	736	1184	1212	1240	1287	1315	000028
35	168	280	380	846	1185	1213	1241	1288	1316	000031
38	173	282	439	877	1186	1214	1242	1289	1317	000036
40	174	283	455	888	1187	1215	1243	1290	1318	000039
44	181	285	457	897	1188	1216	1244	1291	1319	000041
45	183	293	458	925	1189	1217	1245	1292	1320	000064
46	186	308	460	933	1190	1218	1246	1293	1321	000079
48	189	311	461	946	1191	1219	1247	1294	1322	000082
62	195	312	466	956	1192	1220	1248	1295	1323	000089
70	200	314	467	960	1193	1221	1249	1296	1324	000095
74	209	316	469	982	1194	1222	1250	1297	1325	000096
75	214	317	475	1023	1195	1223	1251	1298	1326	000098
76	220	319	490	1024	1196	1224	1252	1299	1327	000100
79	226	320	491	1145	1197	1225	1253	1300	1328	000101

82	232	324	492	1150	1198	1226	1254	1301	1329	000102
86	233	325	493	1151	1199	1227	1255	1302	1330	
89	235	327	494	1172	1200	1228	1256	1303	1331	
94	237	331	501	1173	1201	1229	1257	1304	1346	
98	239	341	512	1174	1202	1230	1258	1305	1368	
107	245	347	526	1175	1203	1231	1259	1306	1374	
119	247	351	535	1176	1204	1232	1260	1307	1380	
121	249	357	553	1177	1205	1233	1261	1308	000005	
122	254	358	561	1178	1206	1234	1262	1309	000007	
130	256	365	580	1179	1207	1235	1273	1310	000020	
134	274	366	592	1180	1208	1236	1282	1311	000021	
142	275	367	623	1181	1209	1237	1283	1312	000023	

22. The ADC Program is wasteful, inefficient and does little to help agriculture. Tax dollars should not be spent on this program. Instead they should be spent on more socially acceptable uses, such as the protection of native wildlife.

4	180	311	508	575	852	1186	1233	1295	1393
8	191	312	510	576	855	1187	1234	1296	1402
12	192	316	511	580	859	1188	1235	1297	000001
15	194	317	513	582	877	1189	1236	1298	000020
16	199	318	515	583	888	1190	1237	1299	000024
17	200	319	516	593	893	1191	1238	1300	000028
19	201	322	518	595	895	1192	1239	1301	000031
24	204	323	521	596	897	1193	1240	1302	000088
26	206	325	522	598	900	1194	1241	1303	000092
29	209	327	524	599	903	1195	1242	1304	000096
31	213	341	525	600	914	1196	1243	1305	
36	214	344	526	601	925	1197	1244	1306	
44	221	352	527	618	928	1198	1245	1307	
49	222	357	528	621	932	1199	1246	1308	
53	223	358	529	623	936	1200	1247	1309	
55	226	366	530	625	946	1201	1248	1310	
61	228	373	534	627	959	1202	1249	1311	
65	229	375	535	644	960	1203	1250	1312	
68	232	376	536	645	962	1204	1251	1313	
77	233	439	537	646	965	1205	1252	1314	
78	234	441	538	647	1022	1206	1253	1315	
82	235	452	539	648	1024	1207	1254	1316	
83	237	453	540	649	1033	1208	1255	1317	
85	244	456	541	651	1038	1209	1256	1318	
86	245	460	545	653	1047	1210	1257	1319	
94	247	461	550	656	1049	1211	1258	1320	
98	251	464	551	664	1050	1212	1259	1321	
101	256	469	553	730	1053	1213	1260	1322	
117	262	473	555	731	1136	1214	1261	1323	
121	263	474	556	734	1146	1215	1262	1324	
125	265	475	557	736	1150	1216	1273	1325	
130	269	477	558	737	1151	1217	1274	1326	
133	274	481	559	741	1159	1218	1277	1327	
135	275	482	560	743	1172	1219	1279	1328	
136	277	487	561	746	1173	1220	1282	1329	
139	278	489	562	747	1174	1221	1283	1330	
141	280	494	564	750	1175	1222	1284	1331	
153	282	496	565	751	1176	1223	1285	1333	
155	283	497	566	752	1177	1224	1286	1340	
156	284	498	567	753	1178	1225	1287	1341	
165	297	499	568	796	1179	1226	1288	1344	
167	298	500	569	825	1180	1227	1289	1345	
170	300	502	570	829	1181	1228	1290	1346	
174	305	503	571	834	1182	1229	1291	1360	
175	307	504	572	838	1183	1230	1292	1368	
176	308	505	573	845	1184	1231	1293	1374	
177	310	506	574	848	1185	1232	1294	1391	

23. APHIS should present a cost-benefit analysis of the program.

11	238	257	336	365	517	1026	000081
121	239	275	343	467	887	1361	000087
156	245	289	348	469	896	000040	000095
195	247	310	351	479	946	000044	000103
199	249	327	356	493	947	000079	000104

24. ADC is not a cost effective program.

12	623	1180	1198	1216	1234	1252	1292	1310	1328
16	748	1181	1199	1217	1235	1253	1293	1311	1329
17	855	1182	1200	1218	1236	1254	1294	1312	1330
24	888	1183	1201	1219	1237	1255	1295	1313	1331
30	925	1184	1202	1220	1238	1256	1296	1314	000001
41	928	1185	1203	1221	1239	1257	1297	1315	000020
226	933	1186	1204	1222	1240	1258	1298	1316	000039
238	960	1187	1205	1223	1241	1259	1299	1317	000081
244	965	1188	1206	1224	1242	1260	1300	1318	000089
272	1024	1189	1207	1225	1243	1261	1301	1319	000092
274	1172	1190	1208	1226	1244	1262	1302	1320	000095
308	1173	1191	1208	1227	1245	1285	1303	1321	000097
321	1174	1192	1210	1228	1246	1286	1304	1322	000098
324	1175	1193	1211	1229	1247	1287	1305	1323	000101
344	1176	1194	1212	1230	1248	1288	1306	1324	000102
462	1177	1195	1213	1231	1249	1289	1307	1325	
523	1178	1196	1214	1232	1250	1290	1308	1326	
564	1179	1197	1215	1233	1251	1291	1309	1327	

25. The ADC budget should be increased.

66	216	442	858	873	891	921	950	1042	1158	000040
100	266	443	860	874	894	922	951	1043	1171	000045
146	270	444	861	876	899	923	957	1045	1272	000046
147	286	445	862	878	901	924	958	1046	1280	000060
148	287	447	863	879	905	926	961	1051	1342	000061
149	294	448	864	880	910	927	963	1052	1347	000062
150	301	484	865	881	911	935	1028	1055	1348	000065
151	302	531	866	882	912	937	1029	1057	1352	000070
152	324	533	867	883	913	940	1030	1058	1364	000090
157	330	578	868	884	915	941	1031	1135	1383	000091
158	363	650	869	885	916	942	1035	1141	1385	000097
160	364	854	870	886	917	943	1036	1142	1394	
169	368	856	871	889	918	944	1037	1143	1395	
184	375	857	872	890	919	948	1041	1144	1401	

26. ADC should collect total loss data.

61	149	158	237	301	359	365	469	874	1361	000044
63	150	160	248	302	361	380	478	896	1383	000063
98	151	161	270	310	362	444	531	944	1385	000086
146	152	169	286	332	363	448	533	964	000040	000087
148	157	195	287	348	364	462	578	1024	000041	000097

27. APHIS should use nonlethal methods only, plus compensation where nonlethal control does not reduce damage to acceptable levels. Producers and ADC should increase research and application of nonlethal and more humane methods. Lethal methods should be used only after nonlethal methods have been tried and found to be unsuccessful.

5	163	311	504	596	925	1201	1259	1346
14	166	312	505	597	928	1202	1260	1360
17	167	314	509	599	929	1203	1261	1362
22	168	317	510	600	932	1204	1262	1365
23	171	318	511	601	933	1205	1273	1368
30	174	320	513	615	934	1206	1274	1369
34	182	321	515	618	936	1207	1283	1370
38	185	324	516	620	946	1208	1285	1380
40	188	325	517	621	949	1209	1286	1382
41	189	327	518	625	953	1210	1287	1384
43	194	333	520	626	955	1211	1288	1390
45	197	336	521	627	956	1212	1289	1391
48	198	337	522	644	959	1213	1290	1393
49	201	341	523	645	962	1214	1291	1402
51	202	342	524	646	965	1215	1292	000001
53	204	344	525	647	1022	1216	1293	000006
54	207	345	527	648	1023	1217	1294	000007
57	215	349	528	649	1024	1218	1295	000025
61	220	352	530	651	1025	1219	1296	000028
63	221	353	534	653	1034	1220	1297	000031
65	223	355	536	657	1040	1221	1298	000041
66	224	356	537	730	1049	1222	1299	000043
68	228	357	538	731	1050	1223	1300	000047
69	229	365	541	733	1053	1224	1301	000071
70	234	373	545	736	1054	1225	1302	000076
71	236	377	547	737	1136	1226	1303	000080
75	237	378	549	740	1145	1227	1304	000082
76	239	380	550	741	1146	1228	1305	000097
80	240	439	551	742	1159	1229	1306	000100
81	243	441	553	746	1172	1230	1307	
83	244	450	554	747	1173	1231	1308	
85	245	452	555	748	1174	1232	1309	
90	247	453	556	750	1175	1233	1310	
92	253	456	557	751	1176	1234	1311	
93	255	459	558	752	1177	1235	1312	
98	256	468	559	753	1178	1236	1313	
103	261	469	562	796	1179	1237	1314	
104	262	472	563	825	1180	1238	1315	
106	263	474	564	829	1181	1239	1316	
110	264	476	565	836	1182	1240	1317	
112	265	477	566	838	1183	1241	1318	
114	268	478	567	845	1184	1242	1319	
120	269	479	568	848	1185	1243	1320	
121	271	480	569	855	1186	1244	1321	
122	274	487	570	859	1187	1245	1322	
123	276	488	571	877	1188	1246	1323	
124	278	489	572	887	1189	1247	1324	
126	281	490	573	888	1190	1248	1325	
132	284	491	574	892	1191	1249	1326	
134	285	492	575	893	1192	1250	1327	
136	289	493	576	895	1193	1251	1328	
137	291	494	577	896	1194	1252	1329	
139	292	496	582	897	1195	1253	1330	
141	293	497	583	900	1196	1254	1331	
144	295	498	585	903	1197	1255	1333	
153	300	499	591	907	1198	1256	1335	
159	306	502	593	909	1199	1257	1344	
161	308	503	595	914	1200	1258	1345	

28. Prior to providing services, ADC should require producers to meet minimum husbandry standards or wildlife damage thresholds; OR ADC should NOT require such standards or thresholds.

18	104	183	303	363	849	1146	1385	000038	000103
30	120	203	308	379	896	1151	000001	000043	000104
32	126	205	313	460	898	1347	000006	000085	
40	136	245	324	470	944	1348	000007	000090	
54	163	247	325	473	1022	1380	000018	000091	
68	167	258	329	480	1024	1382	000020	000095	
81	169	289	333	517	1056	1383	000027	000100	
98	172	299	345	835	1134	1384	000028	000102	

29. Is the DEIS correct in stating that ADC activities help to control the spread of rabies?

305	835	1380	000017

30. The ADC program should operate under different regulatory or organizational arragements.

22	76	120	218	349	624	1022	1369	1385	000042
40	80	169	242	455	896	1024	1379	000012	
47	105	210	327	543	964	1349	1383	000036	

31. ADC needs a Public Information program.

22	128	210	324	368	739	1022	1347	000025
59	138	219	350	445	944	1023	1348	
98	169	242	354	470	964	1151	1368	

32. The Wildlife Damage Control Act of 1931 should be repealed or altered.

236	281	341	897	1033	1343	000007	000079	000102
244	336	447	947	1278	1379	000042	000086	000103

33. The current ADC program deserves support/does not deserve support.

3	149	295	419	614	732	855	970	1079	1270	000080
9	150	297	420	616	733	856	971	1080	1271	000083
12	151	299	421	617	735	857	972	1081	1272	000084
19	152	301	422	619	738	858	973	1082	1275	000085
20	155	302	423	620	739	859	974	1083	1276	000095
21	157	303	424	622	744	860	975	1084	1277	000097
22	158	305	425	624	745	861	976	1085	1280	000098
24	159	309	426	628	749	862	977	1086	1281	
28	160	311	427	629	754	863	978	1087	1332	
30	162	314	428	630	756	864	979	1088	1334	
31	163	316	429	631	757	865	980	1089	1335	
32	164	317	430	632	758	866	981	1090	1336	
33	165	318	431	633	759	867	982	1091	1337	
35	168	319	432	634	760	868	983	1092	1338	
36	169	320	433	635	761	869	984	1093	1339	
37	170	322	434	636	762	870	985	1094	1340	
41	172	323	435	637	763	871	986	1095	1341	
42	173	325	436	638	764	872	987	1096	1342	
44	175	326	437	639	765	873	989	1097	1347	
46	177	327	438	640	766	874	990	1098	1348	
49	179	328	440	641	767	875	991	1099	1351	
51	180	330	442	642	768	876	992	1100	1352	
55	181	331	443	643	769	878	993	1101	1353	
56	182	333	444	650	770	879	994	1102	1354	
57	183	334	445	652	771	880	995	1103	1355	
58	184	335	446	654	772	881	996	1104	1356	
59	185	337	447	656	773	882	997	1105	1357	
60	186	339	448	659	774	883	998	1106	1358	
61	187	340	449	660	775	884	999	1107	1359	
62	188	344	455	661	776	885	1000	1108	1362	
63	189	345	456	662	777	886	1001	1109	1364	
65	190	346	457	663	778	889	1002	1110	1366	
67	191	347	458	665	779	890	1003	1111	1369	
68	195	348	460	666	780	891	1004	1112	1370	
69	197	349	461	667	781	894	1005	1113	1371	
70	198	350	464	668	782	895	1006	1114	1372	
72	199	353	466	669	783	896	1007	1115	1375	
73	200	354	470	670	784	897	1008	1116	1376	
74	204	355	471	671	785	898	1009	1117	1377	
75	205	357	473	672	786	899	1010	1118	1378	
76	207	358	475	673	787	901	1011	1119	1379	
79	208	359	476	674	788	902	1012	1120	1382	
80	209	360	478	675	789	904	1013	1121	1383	
81	212	363	480	676	790	905	1014	1122	1385	
83	213	364	481	677	791	907	1015	1123	1386	
85	214	365	482	678	792	908	1016	1124	1387	
86	216	366	483	679	793	909	1017	1125	1388	
88	220	367	484	680	794	910	1018	1126	1389	
89	221	368	485	681	795	911	1019	1127	1390	
90	222	369	486	682	797	912	1020	1128	1391	
92	224	370	490	683	798	913	1021	1129	1392	
93	225	371	491	684	799	915	1023	1130	1394	
94	226	372	492	685	800	916	1024	1131	1395	
95	228	374	493	686	801	917	1025	1132	1396	
96	229	375	494	687	802	918	1027	1133	1397	
97	231	376	495	688	803	919	1028	1134	1398	
98	233	377	506	689	804	920	1029	1135	1399	
99	235	378	507	690	805	921	1030		1400	
100	236	379	514	691	806	922	1031	1137	1401	
101	237	381	519	692	807	923	1032	1138	000005	
102	239	382	520	693	808	924	1035	1139	000006	
105	241	383	526	694	809	925	1036	1140	000010	
106	242	384	531	695	810	926	1037	1141	000011	
108	243	385	532	696	811	927	1039	1142	000013	
111	245	386	533	697	812	928	1041	1143	000014	
112	247	387	542	698	813	930	1042	1144	000016	

	113	248	388	543	699	814	931	1043	1147	000019	
	114	251	389	546	700	815	935	1044	1148	000021	
	115	252	390	548	701	816	936	1045	1149	000022	
	117	253	391	552	702	817	937	1046	1150	000026	
	118	255	392	553	703	818	938	1047	1151	000029	
	120	258	393	554	704	819		1051	1152	000033	
	122	262	394	555	705	820	940	1052	1153	000034	
	124	263	395	560	706	821	941	1055	1154	000038	
	125	264	396	576	707	822	942	1056	1155	000040	
	126	265	397	578	708	823	943	1057	1156	000041	
	127	266	398	579	709	824	944	1058	1157	000044	
	128	267	399	580	710	826	945	1059	1158	000045	
	130	268	400	584	711	827	948	1060	1159	000046	
	131	269	401	586	712	828	949	1061	1160	000047	
	132	270	402	587	713	830	950	1062	1161	000048	
	133	272	403	588	714	831	951	1063	1162	000049	
	134	273	404	589	715	832	952	1064	1163	000059	
	135	274	405	590	716	835	954	1065	1164	000060	
	136	275	406	591	717	836	955	1066	1165	000061	
	137	276	407	602	718	837	956	1067	1166	000062	
	138	279	408	603	719	839	957	1068	1167	000065	
	139	280	409	604	720	840	958	1069	1168	000066	
	140	282	410	605	721	841	959	1070	1169	000067	
	141	283	411	606	722	842	960	1071	1170	000068	
	142	284	412	607	723	843	961	1072	1171	000069	
	143	285	413	608	724	844	962	1073	1263	000070	
	144	286	414	609	725	849	963	1074	1265	000071	
	145	287	415	610	726	850	964	1075	1266	000072	
	146	288	416	611	727	851	966	1076	1267	000073	
	147	289	417	612	728	853	967	1077	1268	000074	
	148	294	418	613	729	854	968	1078	1269	000075	
34. I have no comment on the EIS or no further comments.	6	50	84	87	193	000009	000022	000032			
35. None of the Above.	3	207	251	296	327	447	517	1022	000104		
	8	212	255	303	332	449	543	1024			
	11	218	257	305	334	450	544	1044			
	38	225	260	310	337	461	747	1056			
	98	233	273	311	338	466	836	1350			
	100	237	275	313	349	469	847	1361			
	169	242	284	317	354	473	909	1365			
	194	244	293	324	361	483	936	1367			
	196	245	294	325	454	500	947	1376			
36. Comment that is irrelevant to or outside the scope of this EIS.	23	131	237	280	375	490	581	896	1381	000027	000085
	27	132	247	298	444	493	593	1264	000015	000030	
	129	179	269	325	471	494	833	1376	000017	000050	
37. The ADC Decision Model in the SEIS is helpful, well done, and complete; or, the decision model is not clear or is not really used by ADC.	000022	000070	000077	000093							
	000042	000073	000078								
38. The SEIS is well done and complete, NEPA followed, gives a complete picture, and has a good risk assessment.	000070	000073	000077	000078							

Appendix M

National Agricultural Statistics Service Surveys of Losses From Wildlife Damage

The data in this Appendix are provided in response to comments and provide context for the sample year (FY 1988) data used in this document.

Cattle and Calves Death Loss

National Agricultural Statistics Service

United States Department of Agriculture

Washington, D.C.

Released May 1, 1992, by the Agricultural Statistics Board. Estimates refer to 1991.

1991 Cattle and Calves Losses Valued at $2.1 Billion

A total of 4.37 million head of cattle and calves were lost from all causes during 1991 in the United States. This excludes Alaska. Predators accounted for 106,000 head or 2.4 percent, while other causes made up the remainder. These total losses cost ranchers and farmers a total of $2.11 billion with predator losses at $41.5 million and other losses at $2.07 billion.

Coyotes were the largest cause of cattle and calf predator losses at 65,900 head or 61.9 percent of the total loss to predators. The value of coyote losses was $24.3 million. Dogs were the second leading cause of predator losses, accounting for 18.4 percent of predator losses. The western and mountain region accounted for 69.2 percent of all predator losses. Respiratory problems lead the other causes with 31.1 percent of the total deaths. The value of these losses was $624 million. The second leading other cause of deaths in cattle and calves was digestive problems with 20.6 percent of the total. The value of these losses was $395 million.

This report is released as a cooperative effort between the National Agricultural Statistics Service, and APHIS - Animal Damage Control and APHIS - National Animal Health Monitoring System.

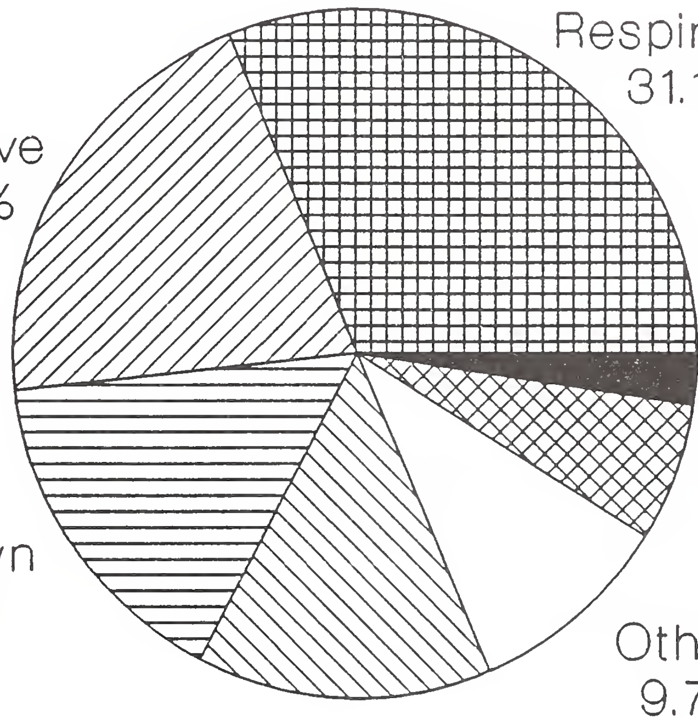
Index is located at the end of this report. For information call Glenda Shepler (202) 720-3040. Office hours are 8:00 a.m. to 4:30 p.m. ET.

Mt An 2 (5-92)

Losses of Cattle and Calves from All Causes,
Number of Head and Total Value, United States, 1991

Cause	Number of Head	Percent of Total Deaths	Total Value
	Head	Percent	1,000 Dollars
Coyotes	65,900	1.5	24,320
Dogs	19,600	0.4	7,560
Mountain Lions & Bobcats	6,300	0.1	2,720
Bears	1,900	0.1	1,020
Wolves	1,800	0.1	640
Other Predators	10,900	0.2	5,280
Total Predators	106,400	2.4	41,540
Digestive Problems	901,600	20.6	394,530
Respiratory Problems	1,358,200	31.1	624,085
Calving Problems	610,100	14.0	304,535
Weather	283,900	6.5	138,405
Poison	69,600	1.6	41,310
Theft	32,600	0.7	16,570
Other Causes	321,500	7.4	196,215
Unknown Causes	686,500	15.7	349,825
Total Non-Predator Causes	4,264,000	97.6	2,065,475
Total Losses	4,370,400	100.0	2,107,015

Losses of Cattle and Calves From All Causes, U.S., 1991



* **Poison, theft, and other causes.**

Losses of Cattle by Predators, Other Causes and Total, by State and United States, 1991

State	Total	Predators		Other Causes	
	Cattle	Cattle	Percent of Total Deaths	Cattle	Percent of Total Deaths
	Head	Head	Percent	Head	Percent
AL	23,000	300	1.3	22,700	98.7
AZ	25,000	1,600	6.4	23,400	93.6
AR	30,000	300	1.0	29,700	99.0
CA	75,000	1,100	1.5	73,900	98.5
CO	55,000	200	0.4	54,800	99.6
CT	2,000	0		2,000	100.0
DE	1,000	1/		1,000	100.0
FL	22,000	400	1.8	21,600	98.2
GA	32,000	400	1.3	31,600	98.7
HI	3,000	1/		3,000	100.0
ID	22,000	100	0.5	21,900	99.5
IL	25,000	200	0.8	24,800	99.2
IN	15,000	100	0.7	14,900	99.3
IA	65,000	300	0.5	64,700	99.5
KS	80,000	200	0.3	79,800	99.8
KY	45,000	300	0.7	44,700	99.3
LA	20,000	200	1.0	19,800	99.0
ME	2,000	1/		2,000	100.0
MD	5,000	100	2.0	4,900	98.0
MA	1,000	1/		1,000	100.0
MI	25,000	100	0.4	24,900	99.6
MN	45,000	100	0.2	44,900	99.8
MS	25,000	300	1.2	24,700	98.8
MO	70,000	500	0.7	69,500	99.3
MT	26,000	300	1.2	25,700	98.8
NE	80,000	200	0.3	79,800	99.8
NV	6,000	1/		6,000	100.0
NH	1,000	0		1,000	100.0
NJ	1,000	1/		1,000	100.0
NM	19,000	1,000	5.3	18,000	94.7
NY	33,000	1/		33,000	100.0
NC	17,000	300	1.8	16,700	98.2
ND	19,000	200	1.1	18,800	98.9
OH	25,000	0		25,000	100.0
OK	85,000	1,800	2.1	83,200	97.9
OR	25,000	200	0.8	24,800	99.2
PA	28,000	100	0.4	27,900	99.6
RI	100	0		100	100.0
SC	12,000	0		12,000	100.0
SD	55,000	300	0.5	54,700	99.5
TN	35,000	400	1.1	34,600	98.9
TX	240,000	3,000	1.3	237,000	98.7
UT	11,000	100	0.9	10,900	99.1
VT	11,000	100	0.9	10,900	99.1
VA	27,000	800	3.0	26,200	97.0
WA	27,000	200	0.7	26,800	99.3
WV	8,000	1/		8,000	100.0
WI	65,000	0		65,000	100.0
WY	15,000	100	0.7	14,900	99.3
US	1,584,100	15,900	1.0	1,568,200	99.0

1/ Less than 100 head for the State, but number is included in U.S. total.
Totals may not add due to rounding.

Losses of Calves by Predators, Other Causes and Total, by State and United States, 1991

State	Total Calves	Predators Calves	Predators Percent of Total Deaths	Other Causes Calves	Other Causes Percent of Total Deaths
	------ Head	--------	Percent	Head	Percent
AL	30,000	2,100	7.0	27,900	93.0
AZ	40,000	3,300	8.3	36,700	91.7
AR	45,000	1,400	3.1	43,600	96.9
CA	140,000	4,300	3.1	135,700	96.9
CO	60,000	2,900	4.8	57,100	95.2
CT	2,000	1/		2,000	100.0
DE	1,000	1/		1,000	100.0
FL	35,000	900	2.6	34,100	97.4
GA	40,000	1,300	3.3	38,700	96.7
HI	4,000	200	5.0	3,800	95.0
ID	50,000	1,200	2.4	48,800	97.6
IL	55,000	1,800	3.3	53,200	96.7
IN	35,000	500	1.4	34,500	98.6
IA	130,000	1,600	1.2	128,400	98.8
KS	70,000	1,100	1.6	68,900	98.4
KY	85,000	3,300	3.9	81,700	96.1
LA	30,000	1,400	4.7	28,600	95.3
ME	4,000	1/		4,000	100.0
MD	8,000	0		8,000	100.0
MA	2,000	1/		2,000	100.0
MI	55,000	100	0.2	54,900	99.8
MN	120,000	1,400	1.2	118,600	98.8
MS	39,000	1,600	4.1	37,400	95.9
MO	135,000	1,800	1.3	133,200	98.7
MT	60,000	1,800	3.0	58,200	97.0
NE	90,000	1,800	2.0	88,200	98.0
NV	15,000	1,600	10.7	13,400	89.3
NH	2,000	1/		2,000	100.0
NJ	2,000	0		2,000	100.0
NM	33,000	1,800	5.5	31,200	94.5
NY	85,000	200	0.2	84,800	99.8
NC	31,000	700	2.3	30,300	97.7
ND	53,000	1,400	2.6	51,600	97.4
OH	50,000	100	0.2	49,900	99.8
OK	145,000	7,000	4.8	138,000	95.2
OR	55,000	4,500	8.2	50,500	91.8
PA	65,000	200	0.3	64,800	99.7
RI	300	0		300	100.0
SC	19,000	600	3.2	18,400	96.8
SD	110,000	3,700	3.4	106,300	96.6
TN	80,000	4,100	5.1	75,900	94.9
TX	300,000	23,400	7.8	276,600	92.2
UT	28,000	1,000	3.6	27,000	96.4
VT	20,000	200	1.0	19,800	99.0
VA	65,000	1,600	2.5	63,400	97.5
WA	30,000	800	2.7	29,200	97.3
WV	18,000	200	1.1	17,800	98.9
WI	185,000	400	0.2	184,600	99.8
WY	30,000	1,200	4.0	28,800	96.0
US	2,786,300	90,500	3.2	2,695,800	96.8

1/ Less than 100 head for the State, but number is included in U.S. total. Totals may not add due to rounding.

Losses of Cattle and Calves by Coyotes and Dogs, by State and United States, 1991

State	Coyotes				Dogs			
	Cattle	% of Total Pred.	Calves	% of Total Pred.	Cattle	% of Total Pred.	Calves	% of Total Pred.
	Head	Percent	Head	Percent	Head	Percent	Head	Percent
AL	100	33.3	1,600	76.2	100	33.3	500	23.8
AZ	1,300	81.3	1,900	57.6	1/		100	3.7
AR	1/		300	21.4	1/		900	64.3
CA	200	18.2	2,600	60.5	200	18.2	1,000	23.3
CO	100	50.0	2,500	86.2	0		200	6.9
CT	0		1/		0		0	
DE	0		0		0		0	
FL	1/		200	22.2	200	50.0	500	55.6
GA	100	25.0	600	46.2	200	50.0	600	46.2
HI	0		0		0		200	100.0
ID	1/		900	75.0	0		1/	
IL	0		1,400	77.8	0		200	11.1
IN	1/		400	80.0	1/		1/	
IA	200	66.7	1,200	75.0	1/		100	6.3
KS	100	50.0	800	72.7	1/		100	9.1
KY	100	33.3	1,800	54.5	100	33.3	1,400	42.4
LA	100	50.0	1,200	85.7	0		100	7.1
ME	0		1/		0		0	
MD	0		0		0		0	
MA	1/		1/		0		0	
MI	0		0		1/		100	100.0
MN	0		400	28.6	1/		100	7.1
MS	1/		1,300	81.3	1/		200	12.5
MO	200	40.0	1,000	55.6	200	40.0	600	33.3
MT	1/		1,200	66.7	1/		100	5.6
NE	100	50.0	1,700	94.4	1/		1/	
NV	1/		1,500	93.8	0		100	6.3
NH	0		1/		0		0	
NJ	0		0		0		0	
NM	200	20.0	1,000	55.6	0		100	5.6
NY	1/		200	100.0	0		0	
NC	0		0		200	66.7	600	85.7
ND	100	50.0	1,300	92.9	0		0	
OH	0		1/		0		1/	
OK	1,300	72.2	4,000	57.1	200	11.1	2,300	32.9
OR	1/		4,000	88.9	1/		100	2.2
PA	0		1/		0		100	50.0
RI	0		0		0		0	
SC	0		0		0		600	100.0
SD	100	33.3	3,500	94.6	1/		200	5.4
TN	0		1,400	34.1	300	75.0	2,100	51.2
TX	1,000	33.3	16,200	69.2	300	6.0	2,300	9.8
UT	1/		800	80.0	0		1/	
VT	1/		200	100.0	1/		0	
VA	0		700	43.8	200	25.0	800	50.0
WA	100	50.0	700	87.5	1/		100	12.5
WV	0		1/		1/		100	50.0
WI	0		300	75.0	0		100	25.0
WY	1/		1,000	83.3	1/		1/	
US	5,900	37.1	60,000	66.3	2,800	17.6	16,800	18.6

1/ Less than 100 head for the State, but number is included in U.S. total. Totals may not add due to rounding.

Losses of Cattle and Calves by Mountain Lions and Bobcats, by Selected States and United States, 1991

State	Mountain Lions and Bobcats			
	Cattle	% of Total Predators	Calves	% of Total Predators
	Head	Percent	Head	Percent
AZ	200	12.5	1,200	36.4
CA	400	36.4	600	14.0
CO	1/		100	3.4
ID	1/		100	8.3
KS	1/		100	9.1
MO	0		1/	
MT	100	33.3	200	11.1
NM	0		200	11.1
OK	0		100	1.4
OR	0		300	6.7
TX	800	26.7	1,700	7.3
UT	1/		1/	
WA	1/		0	
WY	100	100.0	100	8.3
US	1,600	10.1	4,700	5.2

1/ Less than 100 head for the State, but number is included in U.S. total.
Totals may not add due to rounding.

Losses of Cattle and Calves by Other Predators, by States and United States, 1991

State	All Other Predators			
	Cattle	% of Total Predators	Calves	% of Total Predators
	Head	Percent	Head	Percent
AL	100	33.3	0	
AZ	1/		1/	
AR	200	66.7	200	14.3
CA	300	27.3	1/	
CO	1/		1/	
CT	0		0	
DE	1/		1/	
FL	100	25.0	200	22.2
GA	100	25.0	100	7.6
HI	1/		1/	
ID	1/		100	8.3
IL	200	100.0	200	11.1
IN	1/		1/	
IA	1/		300	18.8
KS	1/		100	9.0
KY	100	33.3	100	3.0
LA	1/		100	7.1
ME	1/		0	
MD	100	100.0	0	
MA	0		1/	
MI	1/		0	
MN	1/		500	35.7
MS	200	66.7	100	6.3
MO	100	20.0	100	5.6
MT	1/		100	5.6
NE	1/		1/	
NV	1/		0	
NH	0		0	
NJ	1/		0	
NM	0		1/	
NY	0		0	
NC	100	33.3	100	14.3
ND	100	50.0	100	7.1
OH	0		0	
OK	300	16.7	500	7.1
OR	100	50.0	1/	
PA	100	100.0	1/	
RI	0		0	
SC	0		0	
SD	100	33.3	0	
TN	100	25.0	600	14.6
TX	900	18.0	2,100	9.0
UT	0		1/	
VT	1/		0	
VA	600	75.0	100	6.3
WA	1/		0	
WV	1/		1/	
WI	0		0	
WY	0		1/	
US	4,600	28.9	6,300	7.0

1/ Less than 100 head for the State, but number is included in U.S. total. Totals may not add due to rounding.

Losses of Cattle and Calves by Digestive and Respiratory Problems, by States and United States, 1991

State	Digestive Problems: Cattle	Digestive Problems: % of Total Deaths	Digestive Problems: Calves	Digestive Problems: % of Total Deaths	Respiratory Problems: Cattle	Respiratory Problems: % of Total Deaths	Respiratory Problems: Calves	Respiratory Problems: % of Total Deaths
	Head	Percent	Head	Percent	Head	Percent	Head	Percent
AL	1,600	7.0	5,500	18.3	5,500	23.9	9,000	30.0
AZ	5,400	21.6	12,000	30.0	5,500	22.0	16,000	40.0
AR	2,200	7.3	6,600	14.7	6,700	22.3	24,100	53.6
CA	12,000	16.0	28,900	20.6	17,900	23.9	50,400	36.0
CO	6,600	12.0	11,200	18.7	27,100	49.3	20,400	34.0
CT	100	5.0	900	45.0	300	15.0	400	20.0
DE	100	10.0	300	30.0	1/		100	10.0
FL	1,000	4.5	7,800	22.3	700	3.2	5,200	14.9
GA	3,700	11.6	9,500	23.8	3,800	11.9	10,700	26.8
HI	200	6.7	200	5.0	200	6.7	500	12.5
ID	3,000	13.6	13,000	26.0	3,800	17.3	12,700	25.4
IL	3,700	14.8	12,500	22.7	11,300	45.2	18,800	34.2
IN	1,800	12.0	9,200	26.3	2,100	14.0	13,500	38.6
IA	10,000	15.4	28,300	21.8	25,500	39.2	49,900	38.4
KS	19,600	24.5	10,000	14.3	34,700	43.4	40,600	58.0
KY	5,600	12.4	21,700	25.5	6,500	14.4	19,000	22.4
LA	3,500	17.5	9,300	31.0	2,700	13.5	8,800	29.3
ME	300	15.0	1,400	35.0	500	25.0	1,000	25.0
MD	800	16.0	3,400	42.5	800	16.0	1,900	23.8
MA	100	10.0	900	45.0	100	10.0	400	20.0
MI	4,600	18.4	20,600	37.5	8,200	32.8	19,500	35.5
MN	5,900	13.1	43,200	36.0	15,000	33.3	45,700	38.1
MS	2,600	10.4	4,600	11.8	4,600	18.4	21,500	55.1
MO	4,400	6.3	39,000	28.9	8,300	11.9	38,800	28.7
MT	4,000	15.4	16,200	27.0	4,000	15.4	9,500	15.8
NE	9,400	11.8	27,200	30.2	43,600	54.5	30,900	34.3
NV	400	6.7	3,400	22.7	700	11.7	1,600	10.7
NH	1/		600	30.0	100	10.0	700	35.0
NJ	100	10.0	1,000	50.0	100	10.0	600	30.0
NM	2,000	10.5	2,500	7.6	4,700	24.7	11,300	34.2
NY	5,200	15.8	32,800	38.6	6,000	18.2	26,000	30.6
NC	600	3.5	8,100	26.1	2,000	11.8	9,700	31.3
ND	3,100	16.3	18,500	34.9	4,100	21.6	12,600	23.8
OH	3,300	13.2	19,800	39.6	4,900	19.6	17,400	34.8
OK	9,100	10.7	20,300	14.0	16,300	19.2	56,800	39.2
OR	4,600	18.4	10,800	19.6	3,500	14.0	14,900	27.1
PA	3,300	11.8	23,100	35.5	2,500	8.9	18,800	28.9
RI	0		1/		1/		1/	
SC	2,500	20.8	4,700	24.7	2,000	16.7	5,600	29.5
SD	8,100	14.7	33,400	30.4	16,500	30.0	31,300	28.5
TN	3,200	9.1	24,200	30.3	4,400	12.6	24,800	31.0
TX	18,600	6.9	31,900	10.6	70,000	29.2	127,000	42.3
UT	2,100	19.1	8,100	28.9	1,800	16.4	6,100	21.8
VT	800	7.3	5,500	27.5	1,200	10.9	6,800	34.0
VA	2,600	9.6	16,300	25.1	5,800	21.5	21,900	33.7
WA	5,100	18.9	11,100	37.0	6,300	23.3	8,900	29.7
WV	1,100	13.8	5,100	28.3	800	10.0	4,100	22.8
WI	10,100	15.5	69,200	37.4	13,500	20.8	67,200	36.3
WY	2,200	14.7	7,300	24.3	3,100	20.7	5,000	16.7
US	200,400	12.6	701,200	25.2	409,800	25.9	948,400	34.0

1/ Less than 100 head for the State, but number is included in U.S. total. Totals may not add due to rounding.

Losses of Cattle and Calves by Calving Problems and Weather, by States and United States, 1991

State	Calving Problems: Cattle	Calving Problems: % of Total Deaths	Calving Problems: Calves	Calving Problems: % of Total Deaths	Weather: Cattle	Weather: % of Total Deaths	Weather: Calves	Weather: % of Total Deaths
	Head	Percent	Head	Percent	Head	Percent	Head	Percent
AL	6,000	26.1	5,600	18.7	1,200	5.2	700	2.3
AZ	2,800	11.2	500	1.3	3,200	12.8	5,000	12.5
AR	8,400	28.0	5,800	12.9	2,600	8.7	1,600	3.6
CA	11,600	15.5	11,600	8.3	2,400	3.2	5,400	3.9
CO	3,100	5.6	8,200	13.7	2,500	4.5	3,600	6.0
CT	600	30.0	200	10.0	0		0	
DE	200	20.0	200	20.0	0		1/	
FL	5,700	25.9	5,100	14.6	3,600	16.4	1,500	4.3
GA	7,900	24.7	6,800	17.0	1,200	3.8	1,300	3.3
HI	400	13.3	600	15.0	400	13.3	600	15.0
ID	1,700	7.7	6,700	13.4	500	2.3	4,500	9.0
IL	2,400	9.6	9,500	17.3	1,100	4.4	3,500	6.4
IN	2,600	17.3	4,200	12.0	2,000	13.3	1,200	3.4
IA	5,600	8.6	22,500	17.3	8,700	13.4	14,200	10.9
KS	3,900	4.9	7,000	10.0	9,700	12.1	5,100	7.3
KY	10,500	23.3	13,000	15.3	3,000	6.7	3,600	4.2
LA	4,900	24.5	3,600	12.0	1,400	7.0	1,400	4.7
ME	400	20.0	600	15.0	1/		1/	
MD	1,300	26.0	1,200	15.0	300	6.0	500	6.3
MA	200	20.0	200	10.0	1/		100	5.0
MI	4,900	19.6	6,300	11.5	700	2.8	1,100	2.0
MN	7,400	16.4	10,000	8.3	2,100	4.7	4,300	3.6
MS	6,500	26.0	5,100	13.1	1,500	6.0	1,300	3.3
MO	18,400	26.3	20,500	15.2	11,200	16.0	12,800	9.5
MT	3,000	11.5	13,400	22.3	3,600	13.8	9,000	15.0
NE	7,500	9.4	17,000	18.9	8,500	10.6	8,800	9.8
NV	400	6.7	700	4.7	300	5.0	900	6.0
NH	300	30.0	400	20.0	1/		0	
NJ	400	40.0	200	10.0	1/		1/	
NM	1,800	9.5	4,000	12.1	1,400	7.4	4,900	14.8
NY	8,800	26.7	8,800	10.4	800	2.4	1,300	1.5
NC	4,600	27.1	3,800	12.3	600	3.5	1,200	3.9
ND	1,500	7.9	11,200	21.1	3,200	16.8	3,700	7.0
OH	5,700	22.8	6,800	13.6	500	2.0	900	1.8
OK	13,900	16.4	18,100	12.5	8,800	10.4	12,100	8.3
OR	2,900	11.6	10,600	19.3	600	2.4	2,100	3.8
PA	5,900	21.1	6,000	9.2	800	2.9	500	0.8
RI	1/		1/		0		1/	
SC	3,700	30.8	4,800	25.3	600	5.0	200	1.1
SD	5,200	9.5	16,500	15.0	8,700	15.8	13,700	12.5
TN	11,100	31.7	8,600	10.8	1,000	2.9	2,400	3.0
TX	29,400	12.3	26,100	8.7	9,400	3.9	14,100	4.7
UT	1,400	12.7	4,900	17.5	500	4.5	2,200	7.9
VT	2,500	22.7	3,200	16.0	300	2.7	400	2.0
VA	5,100	18.9	12,400	19.1	1,400	5.2	3,400	5.2
WA	4,700	17.4	2,400	8.0	1,200	4.4	1,500	5.0
WV	2,000	25.0	5,400	30.0	200	2.5	900	5.0
WI	12,600	19.4	10,500	5.7	1,700	2.6	1,200	0.6
WY	1,500	10.0	6,000	20.0	2,600	17.3	8,700	29.0
US	253,300	16.0	356,800	12.8	116,300	7.3	167,600	6.0

1/ Less than 100 head for the State, but number is included in U.S. total. Totals may not add due to rounding.

Losses of Cattle and Calves by Poison and Theft, by States and United States, 1991

State	Poison: Cattle	Poison: % of Total Deaths	Poison: Calves	Poison: % of Total Deaths	Thefts: Cattle	Thefts: % of Total Deaths	Thefts: Calves	Thefts: % of Total Deaths
	Head	Percent	Head	Percent	Head	Percent	Head	Percent
AL	700	3.0	300	1.0	100	0.4	100	0.3
AZ	1,200	4.8	100	0.3	100	0.4	100	0.3
AR	1,400	4.7	200	0.4	500	1.7	200	0.4
CA	1,100	1.5	200	0.1	500	0.7	1,200	0.9
CO	5,100	9.3	900	1.5	400	0.7	400	0.7
CT	0		1/		0		1/	
DE	0		0		0		0	
FL	200	0.9	200	0.6	200	0.9	300	0.9
GA	1,900	5.9	600	1.5	0		200	0.5
HI	1/		1/		100	3.3	1/	
ID	1,800	8.2	500	1.0	300	1.4	500	1.0
IL	600	2.4	600	1.1	100	0.4	100	0.2
IN	600	4.0	200	0.6	100	0.7	0	
IA	500	0.8	1,100	0.8	400	0.6	400	0.3
KS	1,900	2.4	300	0.4	800	1.0	400	0.6
KY	2,300	5.1	700	0.8	300	0.7	400	0.5
LA	300	1.5	200	0.7	700	3.5	200	0.7
ME	1/		0		0		0	
MD	100	2.0	0		100	2.0	100	1.3
MA	1/		1/		1/		1/	
MI	200	0.8	200	0.4	0		0	
MN	500	1.1	500	0.4	0		200	0.2
MS	1,200	4.8	200	0.5	200	0.8	200	0.5
MO	2,400	3.4	1,000	0.7	1,300	1.9	200	0.1
MT	1,400	5.4	400	0.7	300	1.2	400	0.7
NE	1,200	1.5	200	0.2	200	0.3	200	0.2
NV	500	8.3	200	1.3	1/		100	0.7
NH	0		0		0		0	
NJ	1/		1/		0		0	
NM	700	3.7	400	1.2	300	1.6	300	0.9
NY	200	0.6	300	0.4	1/		200	0.2
NC	200	1.2	200	0.6	0		100	0.3
ND	300	1.6	500	0.9	300	1.6	500	0.9
OH	600	2.4	200	0.4	300	1.2	100	0.2
OK	3,700	4.4	2,300	1.6	4,600	5.4	3,700	2.6
OR	1,400	5.6	400	0.7	0		200	0.4
PA	400	1.4	500	0.8	0		0	
RI	0		0		0		0	
SC	200	1.7	600	3.2	0		100	0.5
SD	2,000	3.6	300	0.3	700	1.3	900	0.8
TN	2,000	5.7	1,100	1.4	600	1.7	900	1.1
TX	4,100	1.7	2,100	0.7	900	0.4	1,500	0.5
UT	700	6.4	300	1.1	100	0.9	200	0.7
VT	400	3.6	200	1.0	0		0	
VA	1,100	4.1	400	0.6	200	0.7	100	0.2
WA	300	1.1	100	0.3	600	2.2	300	1.0
WV	300	3.8	200	1.1	1/		100	0.6
WI	1,000	1.5	300	0.2	100	0.2	800	0.4
WY	2,600	17.3	700	2.3	500	3.3	300	1.0
US	49,500	3.1	20,100	0.7	16,200	1.0	16,400	0.6

1/ Less than 100 head for the State, but number is included in U.S. total. Totals may not add due to rounding.

Losses of Cattle and Calves by Other and Unknown Causes,
by States and United States, 1991

State	Other and Unknown			
	Cattle	% of Total Deaths	Calves	% of Total Deaths
	Head	Percent	Head	Percent
AL	7,600	33.0	6,700	22.3
AZ	5,200	20.8	3,000	7.5
AR	7,900	26.3	5,100	11.3
CA	28,400	37.9	38,000	27.1
CO	10,000	18.2	12,400	20.7
CT	1,000	50.0	400	20.0
DE	600	60.0	400	40.0
FL	10,200	46.4	14,000	40.0
GA	13,100	40.9	9,600	24.0
HI	1,600	53.3	1,800	45.0
ID	10,800	49.1	10,900	21.8
IL	5,600	22.4	8,200	14.9
IN	5,700	38.0	6,200	17.7
IA	14,000	21.5	12,000	9.2
KS	9,200	11.5	5,500	7.9
KY	16,500	36.7	23,300	27.4
LA	6,300	31.5	5,100	17.0
ME	700	35.0	900	22.5
MD	1,500	30.0	900	11.3
MA	500	50.0	300	15.0
MI	6,300	25.2	7,200	13.1
MN	14,000	31.1	14,700	12.3
MS	8,100	32.4	4,500	11.5
MO	23,500	33.6	20,900	15.5
MT	9,400	36.2	9,300	15.5
NE	9,400	11.8	3,900	4.3
NV	3,600	60.0	6,500	43.3
NH	500	50.0	300	12.5
NJ	300	30.0	100	7.5
NM	7,100	37.4	7,800	23.6
NY	11,900	36.1	15,400	18.1
NC	8,700	51.2	7,200	23.2
ND	6,300	33.2	4,600	8.7
OH	9,700	38.8	4,700	9.4
OK	26,800	31.5	24,700	17.0
OR	11,800	47.2	11,500	20.9
PA	15,000	53.6	15,900	24.5
RI	1/		100	41.7
SC	3,000	25.0	2,400	12.6
SD	13,500	24.5	10,200	9.3
TN	12,300	35.1	13,900	17.4
TX	104,600	43.6	73,900	24.6
UT	4,300	39.1	5,200	18.6
VT	5,700	51.8	3,700	18.5
VA	10,000	37.0	8,900	13.7
WA	8,600	31.9	4,900	16.3
WV	3,500	43.8	2,000	11.1
WI	26,000	40.0	35,400	19.1
WY	2,400	16.0	800	2.7
US	522,700	33.0	485,300	17.4

1/ Less than 100 head for the State, but number is included in U.S. total.
Totals may not add due to rounding.

Losses and Value of Losses of Cattle by Predators, Other Causes and Total, by States and United States, 1991

State	Total: All Losses	Total: Value Per Head	Total: Total Value	Predators: Losses	Predators: Total Value	Other Causes: Losses	Other Causes: Total Value
	Head	Dollars	1,000 Dol	Head	1,000 Dol	Head	1,000 Dol
AL	23,000	620	14,260	300	185	22,700	14,075
AZ	25,000	680	17,000	1,600	1,090	23,400	15,910
AR	30,000	645	19,350	300	195	29,700	19,155
CA	75,000	850	63,750	1,100	935	73,900	62,815
CO	55,000	705	38,775	200	140	54,800	38,635
CT	2,000	855	1,710	0		2,000	1,710
DE	1,000	820	820	1/		1,000	820
FL	22,000	685	15,070	400	270	21,600	14,800
GA	32,000	630	20,160	400	250	31,600	19,910
HI	3,000	510	1,530	1/		3,000	1,530
ID	22,000	715	15,730	100	70	21,900	15,660
IL	25,000	705	17,625	200	140	24,800	17,485
IN	15,000	705	10,575	100	70	14,900	10,505
IA	65,000	705	45,825	300	210	64,700	45,615
KS	80,000	650	52,000	200	130	79,800	51,870
KY	45,000	680	30,600	300	200	44,700	30,400
LA	20,000	655	13,100	200	130	19,800	12,970
ME	2,000	800	1,600	1/		2,000	1,600
MD	5,000	855	4,275	100	85	4,900	4,190
MA	1,000	825	825	1/		1,000	825
MI	25,000	850	21,250	100	85	24,900	21,165
MN	45,000	775	34,875	100	75	44,900	34,800
MS	25,000	615	15,375	300	185	24,700	15,190
MO	70,000	680	47,600	500	340	69,500	47,260
MT	26,000	765	19,890	300	230	25,700	19,660
NE	80,000	695	55,600	200	140	79,800	55,460
NV	6,000	675	4,050	1/		6,000	4,050
NH	1,000	850	850	0		1,000	850
NJ	1,000	920	920	1/		1,000	920
NM	19,000	685	13,015	1,000	685	18,000	12,330
NY	33,000	910	30,030	1/		33,000	30,030
NC	17,000	640	10,880	300	190	16,700	10,690
ND	19,000	745	14,155	200	150	18,800	14,005
OH	25,000	760	19,000	0		25,000	19,000
OK	85,000	620	52,700	1,800	1,115	83,200	51,585
OR	25,000	690	17,250	200	140	24,800	17,110
PA	28,000	875	24,500	100	90	27,900	24,410
RI	100	780	80	0		100	80
SC	12,000	605	7,260	0		12,000	7,260
SD	55,000	735	40,425	300	220	54,700	40,205
TN	35,000	645	22,575	400	260	34,600	22,315
TX	240,000	675	162,000	3,000	2,025	237,000	159,975
UT	11,000	725	7,975	100	70	10,900	7,905
VT	11,000	930	10,230	100	90	10,900	10,140
VA	27,000	670	18,090	800	535	26,200	17,555
WA	27,000	775	20,925	200	155	26,800	20,770
WV	8,000	620	4,960	1/		8,000	4,960
WI	65,000	905	58,825	0		65,000	58,825
WY	15,000	740	11,100	100	70	14,900	11,030
US	1,584,100		1,130,965	15,900	10,950	1,568,200	1,120,015

1/ Less than 100 head for the State, but number is included in U.S. total.
Values rounded to nearest $5,000. Totals may not add due to rounding.

Losses and Value of Losses of Calves by Predators, Other Causes and Total, by States and United States, 1991

State	Total: All Losses	Total: Value Per Head	Total: Total Value	Predators: Losses	Predators: Total Value	Other Causes: Losses	Other Causes: Total Value
	Head	Dollars	1,000 Dol	Head	1,000 Dol	Head	1,000 Dol
AL	30,000	320	9,600	2,100	670	27,900	8,930
AZ	40,000	330	13,200	3,300	1,090	36,700	12,110
AR	45,000	350	15,750	1,400	490	43,600	15,260
CA	140,000	330	46,200	4,300	1,420	135,700	44,780
CO	60,000	360	21,600	2,900	1,045	57,100	20,555
CT	2,000	300	600	1/		2,000	600
DE	1,000	400	400	1/		1,000	400
FL	35,000	360	12,600	900	325	34,100	12,275
GA	40,000	325	13,000	1,300	420	38,700	12,580
HI	4,000	225	900	200	45	3,800	855
ID	50,000	340	17,000	1,200	410	48,800	16,590
IL	55,000	415	22,825	1,800	745	53,200	22,080
IN	35,000	290	10,150	500	145	34,500	10,005
IA	130,000	340	44,200	1,600	545	128,400	43,655
KS	70,000	340	23,800	1,100	375	68,900	23,425
KY	85,000	325	27,625	3,300	1,075	81,700	26,550
LA	30,000	345	10,350	1,400	480	28,600	9,870
ME	4,000	300	1,200	1/		4,000	1,200
MD	8,000	405	3,240	0		8,000	3,240
MA	2,000	300	600	1/		2,000	600
MI	55,000	345	18,975	100	35	54,900	18,940
MN	120,000	355	42,600	1,400	500	118,600	42,100
MS	39,000	340	13,260	1,600	545	37,400	12,715
MO	135,000	340	45,900	1,800	610	133,200	45,290
MT	60,000	330	19,800	1,800	595	58,200	19,205
NE	90,000	350	31,500	1,800	630	88,200	30,870
NV	15,000	330	4,950	1,600	530	13,400	4,420
NH	2,000	290	580	1/		2,000	580
NJ	2,000	360	720	0		2,000	720
NM	33,000	355	11,715	1,800	640	31,200	11,075
NY	85,000	400	34,000	200	80	84,800	33,920
NC	31,000	315	9,765	700	220	30,300	9,545
ND	53,000	340	18,020	1,400	475	51,600	17,545
OH	50,000	310	15,500	100	30	49,900	15,470
OK	145,000	345	50,025	7,000	2,415	138,000	47,610
OR	55,000	320	17,600	4,500	1,440	50,500	16,160
PA	65,000	415	26,975	200	85	64,800	26,890
RI	300	300	90	0		300	90
SC	19,000	345	6,555	600	205	18,400	6,350
SD	110,000	350	38,500	3,700	1,295	106,300	37,205
TN	80,000	325	26,000	4,100	1,330	75,900	24,670
TX	300,000	335	100,500	23,400	7,840	276,600	92,660
UT	28,000	335	9,380	1,000	335	27,000	9,045
VT	20,000	285	5,700	200	55	19,800	5,645
VA	65,000	310	20,150	1,600	495	63,400	19,655
WA	30,000	315	9,450	800	250	29,200	9,200
WV	18,000	300	5,400	200	60	17,800	5,340
WI	185,000	470	86,950	400	190	184,600	86,760
WY	30,000	355	10,650	1,200	425	28,800	10,225
US	2,786,300		976,050	90,500	30,590	2,695,800	945,460

1/ Less than 100 head for the State, but number is included in U.S. total.
Values rounded to nearest $5,000. Totals may not add due to rounding.

Losses of Cattle and Calves by Cause and Total Value,
by Regions and United States, 1991

Region	Total Predator Losses			Total Non-Predator Losses		
	Cattle	Calves	Total Value	Cattle	Calves	Total Value
	Head		1,000 Dollars	Head		1,000 Dollars
Mountain and West	10,600	63,000	28,590	857,500	1,250,100	1,024,045
Midwest	1,600	9,100	4,415	363,400	800,900	573,385
South and East	3,700	18,400	8,535	347,300	644,800	468,045
U.S.	15,900	90,500	41,540	1,568,200	2,695,800	2,065,475

Region	Total Losses		
	Cattle	Calves	Total Value
	Head		1,000 Dollars
Mountain and West	868,100	1,313,100	1,052,635
Midwest	365,000	810,000	577,800
South and East	351,000	663,200	476,580
U.S.	1,584,100	2,786,300	2,107,015

Losses of Cattle and Calves by Cause and Total Value,
by Regions and United States, 1991

Region	Coyotes			Dogs		
	Cattle	Calves	Total Value	Cattle	Calves	Total Value
	Head		1,000 Dollars	Head		1,000 Dollars
Mountain and West	4,900	45,600	18,720	900	7,000	3,045
Midwest	400	5,000	2,170	500	2,200	1,125
South and East	600	9,400	3,430	1,400	7,600	3,390
U.S.	5,900	60,000	24,320	2,800	16,800	7,560
	Mountain Lions and Bobcats			Bears		
	Cattle	Calves	Total Value	Cattle	Calves	Total Value
	Head		1,000 Dollars	Head		1,000 Dollars
Mountain and West	1,600	4,700	2,720	900	900	975
Midwest	0	1/		0	100	45
South and East	0	0	0	0	0	0
U.S.	1,600	4,700	2,720	900	1,000	1,020

1/ Less than 100 head for the region but number is included in U.S. total.

Losses of Cattle and Calves by Cause and Total Value,
by Regions and United States, 1991

Region	Wolves: Cattle and Calves	Wolves: Total Value	Other Predators: Cattle	Other Predators: Calves	Other Predators: Total Value
	Head	1,000 Dollars	Head		1,000 Dollars
Mountain and West	1,400	480	2,200	3,500	2,660
Midwest	300	130	600	1,300	935
South and East	1/		1,800	1,500	1,685
U.S.	1,800	640	4,600	6,300	5,280

Region	Digestive Problems: Cattle	Digestive Problems: Calves	Digestive Problems: Total Value	Respiratory Problems: Cattle	Respiratory Problems: Calves	Respiratory Problems: Total Value
	Head		1,000 Dollars	Head		1,000 Dollars
Mountain and West	115,500	266,000	171,680	263,800	456,500	338,705
Midwest	46,000	248,400	129,625	95,500	294,900	182,165
South and East	38,900	186,800	93,225	50,500	197,000	103,215
U.S.	200,400	701,200	394,530	409,800	948,400	624,085

1/ Less than 100 head for the region but number is included in U.S. total.

Losses of Cattle and Calves by Cause and Total Value, by Regions and United States, 1991

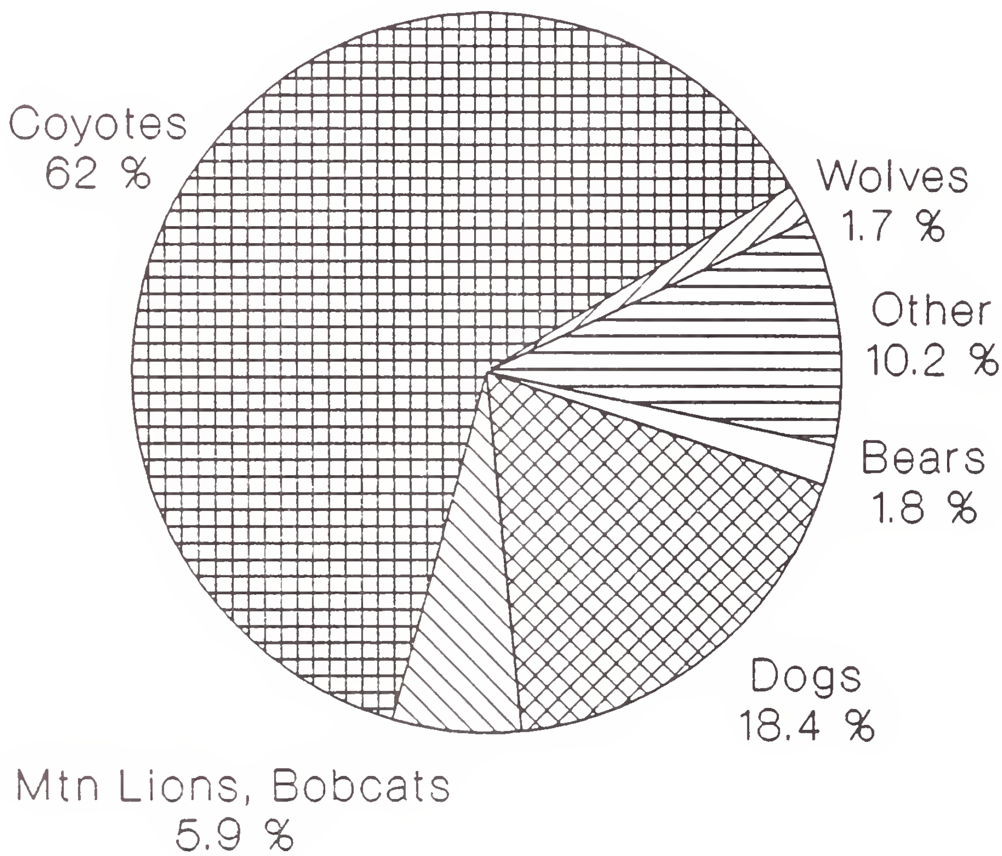
Region	Calving Problems Cattle	Calving Problems Calves	Calving Problems Total Value	Weather Cattle	Weather Calves	Weather Total Value
	Head	Head	1,000 Dollars	Head	Head	1,000 Dollars
Mountain and West	96,700	165,500	124,335	67,600	105,900	83,015
Midwest	68,000	96,100	85,620	30,600	40,800	36,045
South and East	88,600	95,200	94,580	18,100	20,900	19,345
U.S.	253,300	356,800	304,535	116,300	167,600	138,405

Region	Poison Cattle	Poison Calves	Poison Total Value	Thefts Cattle	Thefts Calves	Thefts Total Value
	Head	Head	1,000 Dollars	Head	Head	1,000 Dollars
Mountain and West	30,100	10,000	24,380	10,800	11,300	11,110
Midwest	7,800	4,300	7,195	2,800	2,000	2,745
South and East	11,600	5,800	9,735	2,600	3,100	2,715
U.S.	49,500	20,100	41,310	16,200	16,400	16,570

Losses of Cattle and Calves by Cause and Total Value, by Regions and United States, 1991

Region	Other Causes			Unknown Causes		
	Cattle	Calves	Total Value	Cattle	Calves	Total Value
	Head		1,000 Dollars	Head		1,000 Dollars
Mountain and West	95,000	42,700	81,970	178,000	192,200	188,850
Midwest	54,000	32,200	54,280	58,700	82,200	75,710
South and East	67,100	30,500	59,965	69,900	105,500	85,265
U.S.	216,100	105,400	196,215	306,600	379,900	349,825

Losses of Cattle and Calves From Predators, U.S., 1991



Reliability of Cattle and Calf Death Loss Estimates

Survey Procedures: A random sample of U.S. producers was surveyed to provide data for these estimates. Survey procedures ensured that all cattle producers, regardless of size, had a chance to be included in the survey to collect death loss by cause. Large producers were sampled more heavily than small operations. Data were collected from about 77,000 operators during the first half of January by mail, telephone, and face-to-face personal interviews. Regardless of when operators responded, they were asked to report death losses for cattle and calves for the 1991 calendar year.

Estimating Procedures: These estimates of total death losses and death loss by cause were prepared by the Livestock, Dairy and Poultry Branch, NASS, and reviewed by the 49 States involved. Total cattle and calf death losses from all causes were published in the 1991 "**Meat Animals Production, Disposition, and Income**" Report, released April 13, 1992. To estimate death loss by cause, cattle and calf losses from total predators was first determined. Next the total predator estimate was broken down by specific predators, and a percent of total predator losses was calculated. This procedure was repeated to determine death losses from all other causes. All published loss estimates were rounded to the nearest 100 head. Value estimates were rounded to the nearest $5,000. State estimates of less than 100 head are not published, but are included in U.S. totals. States were combined into regions when sampling variability did not permit individual state data to be released.

Reliability: Since all cattle operators are not included in the sample, survey estimates are subject to sampling variability. Survey results are also subject to non-sampling errors such as omissions, duplications, and mistakes in reporting, recording, and processing the data. The effects of these non-sampling errors cannot be measured directly. They are minimized through rigid quality controls in the data collection process and through a careful review of all reported data for consistency and reasonableness.

Terms and Definitions:

Cattle: Includes all cows, bulls, steers, and heifers weighing over 500 pounds. This includes beef and milk breeds as well as cattle on feed.

Calves: Beef and milk breed steers, heifers, and bulls weighing less than 500 pounds.

Regions: Mountain and Western:

Arizona	Kansas	North Dakota	Texas
California	Montana	Oklahoma	Utah
Colorado	Nebraska	Oregon	Washington
Hawaii	Nevada	South Dakota	Wyoming
Idaho	New Mexico		

Midwest:

Arkansas	Iowa	Minnesota	Ohio
Illinois	Michigan	Missouri	Wisconsin
Indiana			

Southern and Eastern:

Alabama	Louisiana	New Jersey	Tennessee
Connecticut	Maine	New York	Vermont
Delaware	Maryland	North Carolina	Virginia
Florida	Massachusetts	Pennsylvania	West Virginia
Georgia	Mississippi	Rhode Island	
Kentucky	New Hampshire	South Carolina	

Value: Cattle - A straight rounded average of the inventory value per head of cattle over 500 pounds. These data were collected nationally during the January 1, 1991 and 1992 probability Livestock Surveys.

Calves - State market year average price per 100 pounds applied to an average calf weight of 350 pounds. In some localities, the average weight may not adequately reflect local practices. For example, in areas with a large concentration of dairy breed calves, the average calf weight may be somewhat lower.

Digestive Problems: Includes bloat, scours, parasites, etc.

Respiratory Problems: Includes shipping fever, pneumonia, etc.

Poison: Includes nitrate poisoning and noxious feeds or weeds.

Mountain Lions and Bobcats: Includes cougars, pumas and lynx.

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Sheep and Goat Predator Loss

National Agricultural Statistics Service

United States Department of Agriculture

Agricultural Statistics Board

Washington, D.C.

RELEASED: April 24, 1991
3:00 P. M. ET

In this issue:

* Losses of Sheep and Lambs from Coyotes, Dogs and Total Predators by State
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A total of 490 thousand sheep and lambs were lost from animal predators during 1990, in the United States, according to the Agricultural Statistics Board. This resulted in a loss of $21.7 million for farmers and ranchers. This is 36.9 percent (%) of the total losses from all causes.

Coyotes were the largest cause of sheep and lamb losses to predators, with 63.7% of the total losses from all animal predators. Most losses were in the West, but substantial losses from coyotes were prevalent throughout the United States. The value of losses for both sheep and lambs caused by coyotes was $13.6 million. Dogs were the second largest cause, accounting for 13.6% of the sheep and lamb losses due to predators.

Other common predators were mountain lions, bears, foxes, eagles, and bobcats. Wild pigs were a major threat in Hawaii.

Losses of Sheep and Lambs from Predators,
Number of Head, and Total Value, United States, 1990

Predator	Sheep and Lambs	Total Predators	Total Value
	Head	Percent	Dollars
Coyotes	311,900	63.7	13,555,500
Dogs	66,400	13.6	3,424,875
Mountain Lions	16,800	3.4	814,875
Bears	8,000	1.6	454,475
Foxes	12,800	2.6	451,550
Eagles	17,700	3.6	622,500
Bobcats	13,600	2.8	493,750
All Other Animals	42,300	8.7	1,878,175
US	489,500	100.0	21,695,700

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Coyotes were also the largest predator of Goats in the five major producing States, accounting for over half of the total losses caused by predators. The value lost was $5.66 million.

Survey Procedures: Primary data for sheep and lamb loss estimates were from a sample of agricultural producers across the US using probability surveys in all States (except Alaska which was not in the survey) and an additional non-probability survey in a few Western States. The five major goat producing States (see **Terms and Definitions**) also collected losses for Angora, Spanish, and other goats. The probability survey included information from a list of about 57,300 agricultural producers plus additional information from operators of about 7,500 small land area tracts. Information from the probability survey was collected during the first half of January by mail, telephone, and personal interview. Data for the non-probability sample was obtained later. No similar Nationwide survey on predator losses for sheep, lambs, or goats is currently planned for any future date.

Revision Policy: Estimates for inventory numbers and losses to all causes are subject to revision in the following year's report and also after data for the five year Census of Agriculture, conducted by the Department of Commerce, are available. No revision to predator loss estimates is planned.

Estimation Procedures: The estimates were prepared by the Livestock, Dairy, and Poultry Branch, National Agricultural Statistics Service (NASS), and reviewed by all 49 states. Total death losses from all causes for sheep and lambs were as reported in **Meat Animals, Production, Disposition, and Income - 1990 (released April 12, 1991)**. In setting the predator loss estimates, first total predator losses were estimated as a percent of total losses then specific predator losses were generally estimated and rounded to the nearest 100 head using the percent of total predator losses as indicated by the survey data. States were combined into regions (see **Terms and Definitions**) when sampling variability did not permit individual State data to be released.

Reliability: Since all operations with sheep were not included in the sample, survey estimates are subject to sampling variability. This variation, as measured by the relative standard error, was 4.1 percent at the US level for stock sheep inventory and 4.3 percent for sheep on feed inventory. This means that chances are approximately 95 out of 100 that the survey estimate will be within plus or minus 8.2 percent for stock sheep inventory and 8.6 percent for sheep on feed inventory of the value that would result from averaging all possible samples selected from the same population and surveyed using the same procedures. The relative standard error for the specific losses caused by predators was higher.

Survey estimates are subject to non-sampling errors such as omissions, duplications, and mistakes in reporting, recording, and processing the data. These errors cannot be measured directly, but they are minimized through rigid quality controls in the data collection process and a careful review of all reported data for consistency and reasonableness.

Terms and Definitions:

Docked: Lambs with tails removed.

Goats: Any of various hollow-horned ruminant animals (especially of Genus Capra) related to sheep but of lighter build and with backwardly arching horns. For this report included Angora (raised for mohair production) and other goats (for example, Spanish goats raised for meat and milk goats). Major goat producing States are Arizona, Michigan, New Mexico, Oklahoma, and Texas.

Lamb: Sheep less than one year old. In the Western States lamb losses are after docking. For this report, lambs on feed are included.

Regions: Regions were defined to allow comparison with earlier USDA research on sheep and lamb losses. States in each region are:

Mountain and Western:

Arizona	California	Colorado	Hawaii
Idaho	Kansas	Montana	Nebraska
Nevada	New Mexico	North Dakota	Oklahoma
Oregon	South Dakota	Texas	Utah
Washington	Wyoming		

Midwest:

Arkansas	Illinois	Indiana	Iowa
Michigan	Minnesota	Missouri	Ohio
Wisconsin			

Southern and Eastern:

Alabama	Connecticut	Delaware	Florida
Georgia	Kentucky	Louisiana	Maine
Maryland	Massachusetts	Mississippi	New Hampshire
New Jersey	New York	North Carolina	Pennsylvania
Rhode Island	South Carolina	Tennessee	Vermont
Virginia	West Virginia		

Sheep: Mature animals, one year old and older. For this report, includes stock sheep and sheep on feed.

Sheep and Lambs on Feed: Sheep and lambs intended for slaughter market that are being fed grain or other concentrates, or are being pastured on succulent grasses (for example, alfalfa) or crop residues (corn stalks, beet tops) are expected to produce a carcass that will grade select or better.

Stock Sheep: Sheep in the breeding flock, including ewes and rams used for breeding, wethers one year old and older, ewe lambs, and ram lambs.

Value: Sheep - A straight average of the value per head of ewes one year old and older from the January 1, 1990, NASS probability agricultural survey and the January 1, 1991, NASS probability agricultural survey (see Survey Procedures) for each State. Lambs - Each State's 1990 market year average price for lambs applied to an average weight of 60 pounds per lamb. This reflects the opportunity losses of lambs.

If a State was not part of the NASS price estimating program in 1990 (Alabama, Arkansas, Delaware, Florida, Georgia, Mississippi, Rhode Island, and South Carolina), a value for sheep and a price for lambs were estimated based on surrounding States. Hawaii submitted a value and price estimate although they were not part of the program.

Losses of Sheep and Lambs by Coyotes and Dogs,
by States, and United States, 1990

State	Coyotes Sheep	Coyotes Total Pred.	Coyotes Lambs	Coyotes Total Pred.	Dogs Sheep	Dogs Total Pred.	Dogs Lambs	Dogs Total Pred.
	Head	Percent	Head	Percent	Head	Percent	Head	Percent
AL	100	33.3	200	50.0	100	33.3	100	25.0
AZ	2,600	65.0	5,100	68.0	1,000	25.0	1,800	24.0
AR	100	50.0	400	50.0	*	---	300	37.5
CA	5,300	53.5	12,800	72.3	3,300	33.3	2,800	15.8
CO	5,900	65.6	26,300	86.2	400	4.4	300	1.0
CT	*	---	*	---	300	75.0	*	---
DE	0	---	0	---	*	---	0	---
FL	*	---	200	66.7	100	50.0	*	---
GA	*	---	*	---	100	50.0	200	66.7
HI	0	---	0	---	100	5.6	*	---
ID	2,600	72.2	6,200	81.6	400	11.1	500	6.6
IL	700	36.8	1,200	42.9	1,100	57.9	800	28.6
IN	100	5.0	200	8.7	1,800	90.0	2,000	87.0
IA	5,800	61.7	2,900	56.9	3,100	33.0	2,100	41.2
KS	1,300	65.0	1,300	72.2	600	30.0	400	22.2
KY	100	20.0	800	66.7	300	60.0	300	25.0
LA	200	50.0	200	66.7	*	---	*	---
ME	*	---	300	75.0	*	---	0	---
MD	0	---	*	---	100	50.0	100	33.3
MA	*	---	0	---	*	---	*	---
MI	100	25.0	200	25.0	200	50.0	500	62.5
MN	300	18.8	1,700	53.1	400	25.0	500	15.6
MS	100	33.3	300	75.0	100	33.3	*	---
MO	500	50.0	1,500	62.5	400	40.0	800	33.3
MT	6,100	80.3	19,100	83.0	600	7.9	400	1.7
NE	1,500	88.2	4,200	91.3	100	5.9	300	6.5
NV	3,200	71.1	6,300	68.5	300	6.7	400	4.4
NH	*	---	100	50.0	200	66.7	*	---
NJ	0	---	0	---	*	---	*	---
NM	4,300	43.0	10,600	39.3	300	3.0	1,100	4.1
NY	200	20.0	200	28.6	700	70.0	300	42.9
NC	0	---	0	---	500	83.3	1,400	93.3
ND	1,100	64.7	4,500	84.9	500	29.4	600	11.3
OH	200	13.3	1,700	54.8	1,200	80.0	1,300	41.9
OK	2,800	93.3	4,400	89.8	100	3.3	400	8.2
OR	3,200	62.8	9,900	52.7	1,200	23.5	7,100	37.8
PA	*	---	*	---	500	83.3	400	66.7
RI	0	---	0	---	*	---	*	---
SC	0	---	0	---	*	---	*	---
SD	8,200	94.3	20,700	91.2	300	3.5	300	1.3
TN	*	---	100	25.0	200	66.7	200	50.0
TX	16,000	59.2	40,000	50.0	4,000	14.8	4,000	5.0
UT	6,500	69.9	15,000	67.9	700	7.5	1,400	6.3
VT	*	---	300	100.0	*	---	0	---
VA	200	8.0	3,900	70.9	2,100	84.0	1,200	21.8
WA	200	50.0	1,100	78.6	100	25.0	200	14.3
WV	*	---	500	27.8	600	66.7	1,200	66.7
WI	300	60.0	900	69.2	100	20.0	200	15.4
WY	4,300	75.4	21,900	82.3	700	12.3	700	2.6
US	84,500	59.2	227,400	65.4	29,400	20.6	37,000	10.7

* Less than 100 head for the State, but number is included in US total.

Losses of Sheep and Lambs by Mountain Lions, Bears, Foxes and Eagles, by Selected States, and United States, 1990

State	Mountain Lions				Bears			
	Sheep	Total Pred.	Lambs	Total Pred.	Sheep	Total Pred.	Lambs	Total Pred.
	Head	Percent	Head	Percent	Head	Percent	Head	Percent
AZ	200	5.0	200	2.7	1/	---	1/	---
CA	900	9.1	500	2.8	100	1.0	1/	---
CO	1,000	11.1	1,500	4.9	1,500	16.7	1,100	3.6
ID	100	2.8	200	2.6	500	13.9	500	6.6
MT	100	1.3	500	2.2	400	5.3	300	1.3
NV	700	15.6	1,800	19.6	1/	---	100	1.1
NM	200	2.0	400	1.5	1/	---	100	0.4
OR	400	7.8	300	1.6	200	3.9	200	1.1
TX	1,500	5.5	1,000	1.2	0	---	0	---
UT	1,200	12.9	3,100	14.0	500	5.4	1,200	5.4
WA	1/	---	1/	---	0	---	0	---
WY	200	3.5	700	2.6	200	3.5	200	0.8
Oth	0	---	0	---	2/400	9.5	3/300	3.6
US	6,500	4.6	10,300	3.0	3,900	2.7	4,100	1.2

State	Foxes				Eagles			
	Sheep	Total Pred.	Lambs	Total Pred.	Sheep	Total Pred.	Lambs	Total Pred.
	Head	Percent	Head	Percent	Head	Percent	Head	Percent
AZ	0	---	0	---	0	---	100	1.3
CA	1/	---	1/	---	1/	---	700	4.0
CO	0	---	100	0.3	0	---	600	2.0
ID	0	---	100	1.3	0	---	0	---
MT	100	1.3	1,700	7.4	100	1.3	900	3.9
NV	0	---	0	---	100	2.2	300	3.3
NM	0	---	0	---	100	1.0	2,700	10.0
OR	0	---	300	1.6	0	---	700	3.7
TX	500	1.9	6,000	7.5	500	1.9	8,000	10.0
UT	0	---	100	0.5	0	---	400	1.8
WA	0	---	0	---	1/	---	1/	---
WY	100	1.8	1,500	5.6	200	3.5	1,500	5.6
Oth	4/100	1.1	5/2,000	5.2	6/100	0.9	7/500	1.6
US	900	0.6	11,900	3.4	1,200	0.8	16,500	4.8

1/ Less than 100 head for the State, but number is included in US total.
2/ Includes ME, MI, NH, VA and WV. 3/ Includes MI, NH, VA and WV.
4/ Includes MD and SD. 5/ Includes MD, NY, NC, ND, PA, SD, TN, VA and WI.
6/ Includes ME, SD and VA. 7/ Includes FL, GA, ME, SC, SD, TN, VA and WI.

Losses of Sheep and Lambs by Bobcats, by Selected States, and United States, 1990

State	Bobcats			
	Sheep	Total Predators	Lambs	Total Predators
	Head	**Percent**	**Head**	**Percent**
AZ	1/	---	100	1.3
CA	1/	---	400	2.3
CO	0	---	100	0.3
ID	0	---	100	1.3
MT	0	---	0	---
NV	100	2.2	200	2.2
NM	200	2.0	2,800	10.4
OR	0	---	100	0.5
TX	500	1.9	8,000	10.0
UT	100	1.1	600	2.7
WA	0	---	1/	---
WY	0	---	0	---
Oth	1/ 2/	---	3/100	1.2
US	1,100	0.8	12,500	3.6

1/ Less than 100 head for the State, but number is included in US total.
2/ Includes FL and OK.
3/ Includes NC, OK and WV.

Losses of Sheep and Lambs by Other Animals, by States, and United States, 1990

State	All Other Animals			
	Sheep	Total Predators	Lambs	Total Predators
	Head	**Percent**	**Head**	**Percent**
AL	*	---	*	---
AZ	100	2.5	*	---
AR	*	---	100	12.5
CA	200	2.0	400	2.2
CO	200	2.2	400	1.3
CT	*	---	*	---
DE	0	---	*	---
FL	0	---	*	---
GA	*	---	*	---
HI	1,700	94.4	100	50.0
ID	0	---	0	---
IL	100	5.3	800	28.5
IN	100	5.0	100	4.3
IA	500	5.3	100	1.9
KS	100	5.0	100	5.6
KY	*	---	*	---
LA	100	25.0	*	---
ME	0	---	*	---
MD	*	---	*	---
MA	0	---	0	---
MI	*	---	*	---
MN	900	56.2	1,000	31.3
MS	*	---	*	---
MO	*	---	100	4.2
MT	200	2.6	100	0.5
NE	100	5.9	100	2.2
NV	*	---	100	0.9
NH	*	---	0	---
NJ	0	---	0	---
NM	4,900	49.0	9,300	34.3
NY	*	---	0	---
NC	*	---	*	---
ND	100	5.9	100	1.9
OH	100	6.7	100	3.3
OK	*	---	100	2.0
OR	100	2.0	200	1.0
PA	*	---	*	---
RI	0	---	0	---
SC	0	---	0	---
SD	100	1.0	100	0.5
TN	*	---	0	---
TX	4,000	14.8	13,000	16.3
UT	300	3.2	300	1.4
VT	0	---	0	---
VA	*	---	100	1.9
WA	*	---	*	---
WV	*	---	*	---
WI	*	---	*	---
WY	0	---	100	0.5
US	14,700	10.3	27,600	7.9

* Less than 100 head for the State, but number is included in US total.

Losses of Sheep by All Causes and by Predators,
Number and Total Value, by States, and United States, 1990

State	All Causes	Losses by Predators		
	Sheep	Sheep	Per Head	Total Value
	Head	Head	Dollars	Dollars
AL	1/1,000	300	120	36,000
AZ	8,000	4,000	92	368,000
AR	1/1,200	200	78	15,600
CA	32,000	9,900	85	841,500
CO	25,000	9,000	93	837,000
CT	800	400	115	46,000
DE	1/ 2/	---	---	---
FL	1/400	200	120	24,000
GA	1/600	200	120	24,000
HI	1/3,600	1,800	47	84,600
ID	13,000	3,600	81	291,600
IL	7,000	1,900	84	159,600
IN	5,000	2,000	86	172,000
IA	36,000	9,400	71	667,400
KS	9,000	2,000	62	124,000
KY	2,000	500	77	38,500
LA	800	400	78	31,200
ME	700	200	95	19,000
MD	1,000	200	101	20,200
MA	500	100	120	12,000
MI	3,000	400	77	30,800
MN	12,000	1,600	72	115,200
MS	1/500	300	78	23,400
MO	4,500	1,000	67	67,000
MT	40,000	7,600	76	577,600
NE	11,000	1,700	71	120,700
NV	9,000	4,500	82	369,000
NH	700	300	115	34,500
NJ	600	2/	---	---
NM	35,000	10,000	69	690,000
NY	6,000	1,000	93	93,000
NC	1,000	600	76	45,600
ND	9,000	1,700	77	130,900
OH	10,000	1,500	83	124,500
OK	5,000	3,000	65	195,000
OR	19,000	5,100	58	295,800
PA	5,000	600	85	51,000
RI	2/	2/	---	---
SC	2/	2/	---	---
SD	30,000	8,700	75	652,500
TN	1,000	300	88	26,400
TX	92,000	27,000	59	1,593,000
UT	25,000	9,300	80	744,000
VT	600	100	95	9,500
VA	10,000	2,500	65	162,500
WA	3,000	400	79	31,600
WV	4,000	900	64	57,600
WI	5,000	500	82	41,000
WY	29,000	5,700	75	427,500
US	518,500	3/142,200		3/10,534,850

1/ State data not published separately in Production, Disposition, and Income - 1990. 2/ Less than 100 head for the State, but number is included in US total. 3/ Sum of individual State data is 500 head more than US total shown due to rounding at the State level. Sum of individual State data is $53,175 less than US total shown due to rounding of head at the State level.

Losses of Lambs by All Causes, All Predators, Number and Total Value, by States, and United States, 1990

State	All Causes	Losses by Predators		
	Lambs	Lambs	Per Head	Total Value
	------- Head ----------		------- Dollars ----------	
AL	1/1,500	400	34	13,600
AZ	11,000	7,500	37	277,500
AR	1/2,500	800	34	27,200
CA	30,000	17,700	36	637,200
CO	50,000	30,500	33	1,006,500
CT	800	100	60	6,000
DE	1/ 2/	---	---	---
FL	1/600	300	34	10,200
GA	1/1,500	300	34	10,200
HI	1/600	200	31	6,200
ID	16,000	7,600	29	220,400
IL	14,000	2,800	32	89,600
IN	10,000	2,300	31	71,300
IA	53,000	5,100	32	163,200
KS	15,000	1,800	33	59,400
KY	5,000	1,200	30	36,000
LA	3,000	300	34	10,200
ME	1,100	400	60	24,000
MD	3,000	300	34	10,200
MA	1,200	2/	---	---
MI	10,000	800	33	26,400
MN	23,000	3,200	32	102,400
MS	1/900	400	34	13,600
MO	16,100	2,400	30	72,000
MT	40,000	23,000	29	667,000
NE	21,000	4,600	32	147,200
NV	15,000	9,200	29	266,800
NH	1,200	200	60	12,000
NJ	1,000	2/	---	---
NM	35,000	27,000	30	810,000
NY	7,000	700	35	24,500
NC	2,500	1,500	30	45,000
ND	21,000	5,300	31	164,300
OH	28,000	3,100	33	102,300
OK	10,000	4,900	31	151,900
OR	39,000	18,800	31	582,800
PA	12,000	600	35	21,000
RI	1/200	2/	---	---
SC	1/400	100	30	3,000
SD	55,000	22,700	33	749,100
TN	1,200	400	34	13,600
TX	120,000	80,000	35	2,800,000
UT	34,000	22,100	29	640,900
VT	1,500	300	59	17,700
VA	20,000	5,500	32	176,000
WA	7,000	1,400	32	44,800
WV	9,000	1,800	31	55,800
WI	14,000	1,300	33	42,900
WY	45,000	26,600	30	798,000
US	809,900	3/347,300		3/11,235,625

1/ State data not published individually in **Meat Animals, Production, Disposition and Income - 1990.** 2/ Less than 100 head for the State, but number is included in **US** total. 3/ Sum of individual State data is 200 head more than US total shown due to rounding at the State level. Sum of individual State data is $21,600 less than **US** total shown due to rounding of head data at the State level.

Losses of Sheep and Lambs by Specific Predators and Total Value, by Regions, and United States, 1990

Region	Total Predator Losses: Sheep	Total Predator Losses: Lambs	Total Predator Losses: Total Sheep and Lambs Value	Coyotes: Sheep	Coyotes: Lambs	Coyotes: Total Sheep and Lambs Value
	Head	Head	Dollars	Head	Head	Dollars
Mtn and West	115,000	310,700	18,405,825	75,100	209,400	12,250,600
Midwest	18,500	21,900	2,083,775	8,100	10,700	933,800
South and East	8,700	14,700	1,206,100	1,300	7,300	371,100
US	142,200	347,300	21,695,700	84,500	227,400	13,555,500

Region	Dogs: Sheep	Dogs: Lambs	Dogs: Total Sheep and Lambs Value	Mountain Lions: Sheep	Mountain Lions: Lambs	Mountain Lions: Total Sheep and Lambs Value
	Head	Head	Dollars	Head	Head	Dollars
Mtn and West	14,700	22,700	1,812,075	6,500	10,300	814,875
Midwest	8,400	8,500	922,950	0	0	0
South and East	6,300	5,800	689,850	0	0	0
US	29,400	37,000	3,424,875	6,500	10,300	814,875

Losses of Sheep and Lambs by Specific Predators and Total Value, by Regions, and United States, 1990

Region	Bears			Foxes		
	Sheep	Lambs	Total Sheep and Lambs Value	Sheep	Lambs	Total Sheep and Lambs Value
	----- Head ------		Dollars	----- Head ------		Dollars
Mtn and West	3,500	3,800	411,400	800	11,400	429,700
Midwest	*	100	9,075	0	*	1,650
South and East	300	200	34,000	*	400	20,200
US	3,900	4,100	454,475	900	11,900	451,550

Region	Eagles			Bobcats		
	Sheep	Lambs	Total Sheep and Lambs Value	Sheep	Lambs	Total Sheep and Lambs Value
	----- Head -------		Dollars	----- Head ------		Dollars
Mtn and West	1,100	16,100	604,075	1,000	12,400	489,225
Midwest	0	100	3,300	0	0	0
South and East	*	300	15,125	*	*	4,525
US	1,200	16,500	622,500	1,100	12,500	493,750

* Less than 100 head for the region, but the number is included in the US total.

Losses of Sheep and Lambs by Specific Predators and Total Value, by Regions, and United States, 1990

Region	All Other Animals		
	Sheep	Lambs	Sheep and Lambs Value
	Head	Head	Dollars
Mountain and Western	12,300	24,600	1,593,875
Midwest	1,800	2,400	213,000
Southern and Eastern	600	600	71,300
US	14,700	27,600	1,878,175

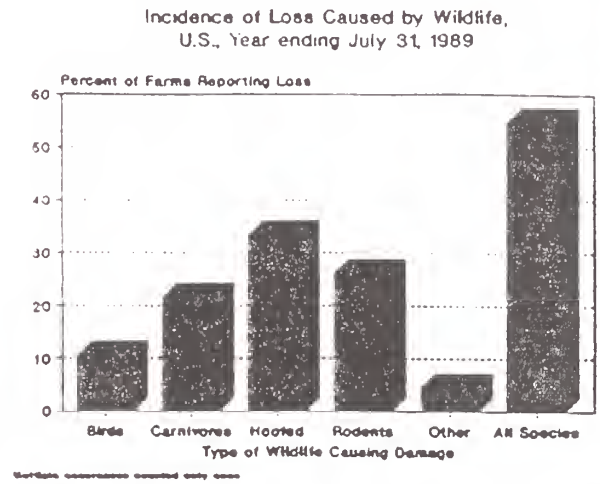
Losses of All Goats (Angora and Other) by Specific Predators and Total Value, 5-State Total, 1990

Predator	Goats	Predator	Goats	Total Value
	Head		Head	Dollars
Coyotes	64,900	Eagles	16,300	
Dogs	9,700	Bobcats	20,600	
Mountain Lions	2,900	All Other Animals	10,900	
Bears	0			
Foxes	4,100	5-State Total	129,400	5,661,250

HIGHLIGHTS OF THE ANIMAL DAMAGE CONTROL SURVEY

NATIONAL AGRICULTURAL STATISTICS SERVICE

Over one half of United States farms surveyed last August by the National Agricultural Statistics Service reported suffering losses caused by wildlife during the twelve month period ending July 31, 1989. The category most frequently reported as a cause of damage was "Hoofed Animals", with 33% of survey respondents reporting loss. This category includes deer, antelope, elk, moose, javelina, and wild horses, burros, and hogs. Rodents and rabbits were the second most frequently reported cause, with 26% of the surveyed farms reporting loss to this grouping. Twenty-two percent of the farms reported having losses caused by carnivores, which are predominately flesh eating mammals such as coyotes, fox, raccoon, and skunks. Birds were responsible for losses to 11% of the farms in the survey.



Reported incidence of wildlife caused damage to farms in the Northeast and Northcentral United States was somewhat higher than that in the Southeast and West. Losses caused by hoofed animals, primarily deer, showed the most variation across regions, rising from 16 percent in the West to over 41 percent in the Northcentral region. While these results indicate wildlife problems may be more widespread in the northern regions, they do not reflect the relative magnitude of losses sustained, either by cause or region.

PERCENT OF FARMS EXPERIENCING LOSS DUE TO ANIMAL DAMAGE, BY TYPE OF SPECIES, U.S. AND REGIONS 1/, AUGUST 1, 1988 THROUGH JULY 31, 1989 2/.

TYPE OF SPECIES	NORTH-EAST	SOUTH-EAST	NORTH-CENTRAL	WEST	UNITED STATES
BIRDS	10.8	11.2	9.3	13.3	10.6
CARNIVORES	24.1	20.7	20.6	22.2	21.7
HOOFED ANIMALS	37.7	20.4	41.4	15.9	33.4
RODENTS/RABBITS	30.2	18.6	27.5	23.1	26.3
OTHERS	3.2	8.7	4.0	5.9	4.6
ALL SPECIES	57.8	47.5	57.5	49.1	54.9

1/ Northeast: CT,DE,KY,ME,MD,MA,NH,NJ,NY,NC,PA,TN,RI,VT,VA,WV
Southeast: AL,AR,FL,GA,LA,MS,SC
Northcentral: IL,IN,IA,KS,MI,MN,MO,NE,ND,OH,SD,WI
West: AK,AZ,CA,CO,HI,ID,MT,NV,NM,OK,OR,TX,UT,WA,WY

2/ Multiple occurrences counted only once.

PERCENT OF FARMS EXPERIENCING LOSS DUE TO ANIMAL DAMAGE, BY TYPE OF FARM 1/, U.S. AND REGIONS 2/, AUGUST 1, 1988 THROUGH JULY 31, 1989 3/.

TYPE OF FARM	NORTH-EAST	SOUTH-EAST	NORTH-CENTRAL	WEST	UNITED STATES
LIVESTOCK	56.5	44.6	60)	48.9	55.1
FIELD CROPS	59.8	53.8	57.1	46.2	55.1
FRUIT, VEG., NUTS	65.5	56.7	48.0	64.9	55.8
OTHER	32.4	41.6	23.3	33.5	28.9
ALL SPECIES	57.8	47.5	57.5	49.1	54.9

1/ Farms classified by reported principal product category.
2/ Northeast: CT,DE,KY,ME,MD,MA,NH,NJ,NY,NC,PA,TN,RI,VT,VA,WV
Southeast: AL,AR,FL,GA,LA,MS,SC
Northcentral: IL,IN,IA,KS,MI,MN,MO,NE,ND,OH,SD,WI
West: AK,AZ,CA,CO,HI,ID,MT,NV,NM,OK,OR,TX,UT,WA,WY
3/ Multiple occurrences counted only once.

ABOUT THE SURVEY

The 1989 Animal Damage Control Survey was conducted to assess the incidence of losses to agriculture caused by wildlife. A nationwide sample of 20,000 farms and ranches was randomly selected for interviewing. All data was collected during early August through computer assisted telephone interviewing. Responses were received from over 16,000 farms.

These highlights of the results were prepared for free distribution to the farmers and ranchers participating in the survey. For further information contact Operational Support Staff, Animal Damage Control, Room 820, 6505 Belcrest Rd. Federal Building, Hyattsville, MD. 20782, (301) 436-8281.

NATIONAL AGRICULTURAL
STATISTICS SERVICE
P O Box 7068
St. Paul, MN 55107

BULK RATE
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Appendix N

Examples of APHIS ADC Decision Model, and Cost Comparison

Appendix N

Examples of APHIS ADC Decision Model, and Cost Comparison

Table of Contents

Appendix N, Part I

Examples of APHIS ADC Decision Model

A. Introduction

Part I of this Appendix provides examples of the implementation of the Animal and Plant Health Inspection Service (APHIS) Animal Damage Control (ADC) decision model described in Chapter 2. The examples, which are drawn from APHIS ADC field experience include:

- Coyote, Predation on Sheep Grazed on Public Land, Colorado.
- Coyote, Predation on Sheep Grazed on Private Land, Virginia.
- Cattle Egret, Rookery that Poses Public Health and Safety Risks in a Residential Area, Texas.
- Cattle Egret, Rookery that Poses Public Health and Safety Risks in an Airport, Arkansas.
- Beaver, Flooding Damage to Trees and Pasture, Texas.
- Beaver, Girdling Damage to Trees, Texas.
- Blackbirds, Roost that Poses Public Health and Safety Risks to a School, Kentucky.
- European Starling, Forage Loss and Health Risks to Livestock and Farm Workers at a Dairy Farm, Vermont.

B. Coyote Predation on Sheep (Public Land, Colorado)

1. Receive Request for Assistance

An APHIS ADC Office in Colorado received a request for assistance from a rancher, reporting the killing of two lambs by coyotes the previous week. More kills were expected to occur if nothing was done to protect the sheep.

2. Assess Problem

The APHIS ADC specialist considered the following types of questions during his initial evaluation:

- Is the problem within the purview of APHIS ADC?
- Where exactly did the damage occur?
- Is a cooperative agreement in effect for APHIS ADC to provide control assistance for this type of problem in this area?
- Would APHIS ADC assistance be compatible with the Annual Work Plan developed jointly the U.S. Department of Agriculture (USDA), Forest Service (FS), and APHIS ADC personnel for this area?
- Does APHIS ADC have expert personnel available to visit the damage site to confirm the damage, formulate control strategy, and carry out the control?
- Who can provide more information (e.g., herder, foreman, camp tender, other ranch employees, or others)? Where and when can APHIS ADC personnel contact them?

The results of the assessment follow.

a. Type of Damage

Two lambs had been killed from a flock of 1,000 ewes and 1,200 lambs.

b. Location

The rangeland was located on National Forest land in Colorado.

c. Site Visit

A site visit was made two days later by the local wildlife damage control specialist, who confirmed two dead lambs, both killed by coyotes. The herder reported hearing coyotes howl nearby on the previous morning. The herder had shot at a coyote but missed. Other than watching the sheep as closely as possible, the rancher and herder had not tried control methods.

d. Responsible Species

The problem was identified as a killing by coyotes.

e. Previous Control

Shooting and watchfulness were both unsuccessful.

f. Authorization/Existing Agreement

Existing agreements with FS authorizes APHIS ADC personnel to conduct damage control work in this area. A forest-wide environmental assessment exists for animal damage, jointly prepared by APHIS ADC and FS.

g. Assessment

This problem was within the purview of APHIS ADC. APHIS ADC personnel agreed to provide control assistance.

3. Evaluate Wildlife Damage Control Methods

The APHIS ADC specialist evaluated the potential damage control methods (see Table N-1) to determine which methods were applicable. The basis for selection or rejection of the control methods and the results of the evaluation follow.

Table N-1

Selection of Control Methods for Coyote (Public Land, Colorado)[a]

Potential Damage Control Method	Basis for Selection or Rejection
Resource Management	
Animal Husbandry:	
Night penning	Not allowed by Forest Service
Shed lambing	Not applicable to this situation; ewes not lambing
Time of breeding (change)	Not applicable; does not address the present problem; climate conditions at the area dictate the necessary time to lamb; economic conditions direct lambing (sale timing)
Move livestock (to safer pasture)	Not applicable; no safer range is available; coyotes would accompany sheep anywhere they are moved on this allotment
Change class of livestock	Not applicable; this range is designated as a sheep allotment by FS range analysis
Herding	Applicable; already being practiced; FS rules preclude closer herding
Use of guard animals (dogs)	Guard dogs not available in the short term; may be applicable in the future

(Continued)

Table N-1 (Continued)

Selection of Control Methods for Coyote (Public Land, Colorado)[a]

Potential Damage Control Method	Basis for Selection or Rejection
Crop Selection and Planting Schedules:	
Time of harvest	Not applicable
Time of planting	Not applicable
Change crops	Not applicable
Physical Barriers	
Fencing (to exclude predators)	Not allowed by Forest Service
Sheathing:	
Entrance barriers	Not applicable
Wildlife Management	
Lure Crops/Alternate Foods:	
Goats sacrificed to protect sheep	Not practical; not allowed on this allotment
Frightening Devices:	
Propane exploders	Not practical; devices could not be sited to protect the herd because of the open herding required by Forest Service
Lights	do.
Harassment of predators	do.
Other scaring devices—	do.
Strobe-siren (electronic guard)	do.
Effigies (scarecrows)	do.
Kill or Relocation:	
Leghold traps	Applicable; may not be practical because of the open herding practiced
Snares—	
Neck snares	do.
Foot snares	No advantage over leghold traps
Catch poles	Not applicable to free-ranging coyotes
Denning	Not applicable; wrong time of year
Shooting—	
Aerial hunting	Applicable; not practical because of vegetation
Calling and shooting	
Spotlighting and shooting	Prohibited by State law
Shooting on sight	Applicable; herder currently doing this to the best of his ability
Hunting dogs/shooting—	
Tracking/trailing dogs	Could be applicable, but appropriate dogs and expertise not available
Decoy dogs	Applicable but unavailable
Chemical toxicants—	
M-44 sodium cyanide ejector	Applicable
Livestock protection collar	Not applicable; Colorado policy does not allow on open range
Gas cartridge	Not applicable; wrong time of year

[a] A detailed description of methods of control is given in Appendix J. See also the description of the APHIS ADC Decision Model in Chapter 2.

a. Legal, Administrative

The State of Colorado prohibits spotlighting and shooting and the use of the livestock protection collar on open range. All other control methods were available.

b. Biological

In this area of Colorado, coyotes are abundant, with a stable population. The kills were suspected to have been made by a pair of coyotes providing food for pups. Lambs in the area provided coyotes with an abundant, readily available food source. For several weeks the food requirement of the growing pups would increase. The pups had reached the age of being able to follow the adults. Following the kills, the pups would likely become involved in the attacks and in kills as they joined the adults on hunting excursions. The flock could become an easy target for other family groups of coyotes. No threatened or endangered species were observed in the area. However, if such species had been found in the area, consultation with Department of Interior, U.S. Fish and Wildlife Service (USFWS) would begin.

c. Sociocultural

A significant part of the local economy in the area centered around livestock production. The livelihood of the livestock owner and his employees was dependent on the annual lamb crop, and predator losses posed the greatest risk to this crop. There was considerable public opposition to predator control conducted on public lands from national organizations that objected to predator control. Very little opposition existed at the local level. The area where predator control operations would be conducted was not a high public-use area. Little or no human activity was expected in the area for the next few weeks; therefore, pets were not likely to be in the area.

d. Economic

The value of the lambs that were killed was $70.00 each, which was a minimal loss. However, based on the circumstances, such as flock location, time of year, and coyote numbers in the area, losses were certain to continue. Losses could likely be held to an acceptable level if predator control measures were implemented immediately. A review of previous records indicated that predator losses ran as high as 16 percent of the lamb crop for years when control measures were delayed or not implemented, compared to 2 percent of the crop when control measures were initiated immediately following the initial kills.

e. Physical

Dense vegetation (brush and timber) in the area reduced the effectiveness of aerial hunting. The remote area of the damage site required a significant amount of foot and horseback travel, which limited the area the specialist could cover each day.

f. Applicable Methods

Based on the evaluation, the following methods were considered as applicable control methods: herding, using guard animals, aerial hunting, calling and shooting, shooting coyotes on sight, and using M-44 sodium cyanide ejectors.

4. Formulate Wildlife Damage Control Strategy

The APHIS ADC specialist and the rancher formulated a control strategy for the damage problem as a result of the step III evaluation. The order of consideration was (A) methods applicable by technical assistance, and (B) direct control, including nonlethal methods and other methods. In the final selection of the methods, effectiveness will be a consideration.

a. Technical Assistance

Three methods were appropriate for the rancher to implement—herding, use of guard dogs, and shooting coyotes on sight. Herding and shooting coyotes on sight already were being used by the herder to the best of his ability. The use of guard dogs was a possibility for future application, but had no timely potential to stop the current damage situation. The current damage could not be stopped through technical assistance.

b. Direct Control

(1) Nonlethal

No practical, nonlethal methods were available other than those already considered in connection with technical assistance. The current damage could not be stopped with nonlethal methods.

(2) Lethal

Other methods applicable to this case included aerial hunting, calling and shooting, and using M-44 sodium cyanide ejectors. After careful inspection of the damage site, the APHIS ADC specialist ruled out aerial hunting as a practical option because the vegetation (brush and patches of timber) was so dense that it would be difficult to spot coyotes from the aircraft. Practical options for direct control assistance were limited to calling and shooting and using M-44 ejectors.

c. Decision

The strategy adopted for this damage situation was a combination of technical assistance (continued herding and shooting coyotes on sight, plus using guard dogs for damage prevention in the future) and direct control (calling and shooting and using M-44 cyanide ejectors).

5. Provide Assistance

The following technical assistance recommendations were made: (1) Continue herding as intensively as allowed by FS regulations; (2) continue to attempt to shoot coyotes on sight; and (3) get a livestock guard dog as soon as possible, to be integrated into operation with APHIS ADC assistance. The APHIS ADC specialist checked the herder's rifle to be sure it was sighted in and provided the rancher with information on the acquisition and management of livestock guard dogs.

Direct control services provided by APHIS ADC personnel were: (1) Calling and shooting conducted near the flock for three consecutive mornings, and (2) four M-44 sodium cyanide ejectors set near coyote travel ways. Consequently, two coyotes were called and shot and another was taken by M-44.

6. Monitor and Evaluate Results of Control Actions

For the following month, the APHIS ADC specialist visited the herder weekly to determine if more predation had occurred and to check the M-44s. There were no further predation incidents. APHIS ADC actions and animals removed were reported to the APHIS ADC State office, the FS District Ranger, and the rancher. No further assistance was required.

7. End of Project

The project ended at the end of the month when the APHIS ADC specialist removed all M-44 ejectors from the area.

C. Coyote Predation of Sheep (Private Land, Virginia)

1. Receive Request for Assistance

A cattle and sheep producer in Virginia contacted the District APHIS ADC Office early in March to report losses of sheep and calves that he suspected might be attributable to coyotes. Over the fall and winter the farmer had discovered the remains of 19 ewes and lambs. Losses resumed in March, with a total of two calves and 47 lambs killed. In addition, 18 ewes and lambs were reported lost during the same period on five other farms within a two-mile radius. APHIS ADC was asked for help to alleviate the problem. An APHIS ADC specialist made arrangements to meet with the farm manager to inspect and evaluate the damage.

2. Assess Problem

The APHIS ADC specialist considered the following types of questions during his initial evaluation:

- Is the problem within the purview of APHIS ADC?
- Where exactly did the damage occur?
- Is a cooperative agreement in effect for APHIS ADC to provide control assistance for this type of problem in this area?
- Does APHIS ADC have expert personnel available to visit the damage site to confirm the damage, formulate control strategy, and carry out the control?
- Who can provide more information (e.g., herder, foreman, other farm employees, or others)? Where and when can APHIS ADC personnel contact them?

The results of the assessment follow.

a. Type of Damage

The killing of sheep and calves by coyotes on private farms.

b. Location

The damage occurred on a farm in southwestern Virginia.

c. Site Visit

The APHIS ADC specialist was able to verify, after examining carcasses and skeletal remains, that two calves and 22 of 28 sheep lost were killed by coyotes. Eight of the

lambs were killed and eaten inside a night pen constructed around the residence of the farm manager. Lack of physical evidence precluded determination in the remaining six cases, although detailed descriptions of the carcasses provided by the farm manager were indicative of coyote attack and feeding behavior. Nothing unusual was seen or heard by the farm manager or adjacent landowners about the time the damage occurred.

The kills occurred in a large fenced pasture adjacent to mountainous terrain and in a small fenced yard directly behind the farm manager's residence. Coyote tracks and scats were identified by the APHIS ADC specialist at several locations where carcasses were found. Fencing consisted primarily of 6-inch woven wire, which was recently constructed and in excellent condition. Coyotes were crossing these fences by digging or crawling beneath the bottom wire. Several of these "crawls" were identified by the presence of fresh digging and coyote hair caught on the fence wire.

d. Responsible Species

The problem was identified as a killing by coyotes.

e. Previous Control

Shed lambing and night confinement had been attempted by the landowner. Trapping had been attempted by an adjacent landowner, who believed that at least one coyote had been trapped but escaped.

f. Authorization/Existing Agreement

A Memorandum of Understanding between the Virginia Cooperative Extension Service, Virginia Department of Agriculture and Consumer Services, Virginia Department of Game and Inland Fisheries (cooperators), and USDA, APHIS, ADC establishes a cooperative relationship between the parties to further their common interest and responsibilities in resolving animal damage conflicts.

A Cooperative Service Agreement exists between the Virginia Department of Agriculture and Consumer Services (VDACS) and USDA, APHIS, ADC. This agreement provides for cooperative State and Federal coyote damage control by providing farmers, growers, and producers the necessary technical and operational assistance in identifying, controlling, and abating threats to agricultural animals.

g. Assessment

The problem was determined to be within the purview of APHIS ADC. The APHIS ADC specialist agreed to provide control assistance.

3. Evaluate Wildlife Damage Control Methods

The APHIS ADC specialist evaluated the potential damage control methods (see Table N-2) to determine which methods were applicable. The basis for selection or rejection of the control methods and the results of the evaluation follow.

a. Legal, Administrative

The State of Virginia prohibits aerial shooting. No chemical repellents or toxicants are currently registered for use on coyotes in Virginia.

N Appendix

Table N-2

Selection of Control Methods for Coyote (Private Land, Virginia)[a]

Potential Damage Control Method	Basis for Selection or Rejection
Resource Management	
Animal Husbandry:	
Night penning	Not applicable; in use but ineffective; confinement in an enclosed building might be more effective but would be cost-prohibitive because of feeding requirements
Shed lambing	Applicable; currently in use but ineffective
Time of breeding (change)	Not applicable; predation is not totally predicated on season
Move livestock (to safer pasture)	Not applicable; no safer pasture is available; coyotes would accompany sheep anywhere they are moved
Change class of livestock	Not practical
Herding	Not applicable
Use of guard animals (dogs)	Applicable
Crop Selection and Planting Schedules:	
Time of harvest	Not applicable
Time of planting	Not applicable
Change crops	Not applicable
Physical Barriers	
Fencing (to exclude predators)	Applicable; modification of existing woven wire fencing and some construction of additional woven wire pasture fencing would greatly restrict coyote access to sheep and cattle and facilitate snaring of offending individual coyotes
Sheathing:	
Entrance barriers	Not applicable
Wildlife Management	
Lure Crops/Alternate Foods:	
Goats sacrificed to protect sheep	Not practical; predation already occurring to multiple resources. Operation too small to be feasible.
Frightening Devices:	
Propane exploders	Not practical; noise would be unacceptable to neighbors
Lights	Applicable; current level of activity significant but ineffective
Harassment of predators	Applicable; not advisable because of safety risk to neighbors
Other scaring devices—	
Strobe-siren (electronic guard)	Applicable; potential for use; will consider in near future when units become available
Effigies (scarecrows)	Not practical
Kill or Relocation:	
Leghold traps	Applicable; effective and selective
Snares—	
Neck snares	Applicable; selective, effective, inexpensive, not labor intensive
Foot snares	No advantage over leghold traps
Catch poles	Not applicable to free-ranging coyotes
Denning	Not applicable; den location extremely difficult due to forested, mountainous terrain

(Continued)

Table N-2 (Continued)

Selection of Control Methods for Coyote (Private Land, Virginia)[a]

Potential Damage Control Method	Basis for Selection or Rejection
Shooting—	
Aerial hunting	Not applicable; not legal in Virginia
Calling and shooting	Applicable; effective and selective
Spotlighting and shooting	Need rationale
Shooting on sight	Not applicable; difficult because of noctural and covert nature of coyotes
Hunting dogs/shooting—	
Tracking/trailing dogs	Not applicable; no trained dogs available
Decoy dogs	Applicable but unavailable
Chemical toxicants—	
M-44 sodium cyanide ejector	Not applicable
Livestock protection collar	Not applicable
Gas cartridge	Not applicable

[a] A detailed description of methods of control is given in Appendix J. See also the description of the APHIS ADC Decision Model in Chapter 2.

b. Environmental Considerations

(1) Biological

No threatened or endangered species inhabit the general area of the damage site. Although no studies of the coyote population had been conducted and no system was in place to monitor its growth, the increasing frequency and broadening distribution of coyote sightings and depredations suggested the coyote population was increasing and its range throughout the region was rapidly expanding.

(2) Sociocultural

Historically, sheep and cattle production had not experienced severe or chronic losses to large predators. Therefore, producers lacked the knowledge, experience, and expertise to effectively control coyote damage to livestock. A segment of the rural population developed a negative, even hostile attitude toward coyotes, while other segments of the public considered the species a valuable wildlife resource. A professional, ecologically sound damage control effort was needed to demonstrate practices and control techniques and reduce the severity of coyote damage, animosity toward the species, and the need for professional assistance in the future.

(3) Economic

Coyote damage in the area had been extensive over the last year. The farmer had suffered the loss of 47 ewes and lambs and two calves since the previous fall. His total loss was valued at approximately $3,600. Eighteen ewes and lambs lost on five other farms within a two-mile radius during the same period represented an additional $1,000 loss.

c. Applicable Methods

Based on the evaluation, the following methods were considered practical: Livestock guarding dogs, improvement of pasture fencing, electronic frightening devices, leghold traps, snaring, and calling and shooting.

4. Formulate Wildlife Damage Control Strategy

The APHIS ADC specialist and the livestock producer formulated a control strategy and options to address the damage problem as a result of the step III evaluation. The order and emphasis of consideration was (A) methods applicable by technical assistance, and (B) direct control methods, including nonlethal methods and lethal methods. Effectiveness will be considered in the final selection of the methods.

a. Technical Assistance Recommendations

Three of the methods deemed to be appropriate for implementation by the producer were (1) improvement of pasture fencing according to APHIS ADC recommendations; (2) acquisition and use of a livestock guarding dog, along with APHIS ADC assistance and training; and (3) use of an "Electronic Guard" strobe siren device. No further assistance was required.

b. Direct Control

(1) Nonlethal

No practical nonlethal methods were available other than those already considered in connection with technical assistance. The current damage could not be stopped by nonlethal methods alone.

(2) Lethal

The remaining available methods applicable in this case included leghold traps, snares, and calling and shooting.

c. Decision

The strategy adopted for this damage situation was a combination of technical assistance (improvement of fencing, the use of guard dogs, use of scaring device) and direct control (use of leghold traps, use of snares, and calling and shooting).

5. Provide Assistance

The following technical assistance recommendations were made: (1) Finish construction of woven-wire perimeter fencing around all boundaries where sheep or calves are pastured and modify existing woven-wire fence to eliminate all gaps greater than two inches between the ground and the base wire of the fence; (2) purchase a livestock guarding dog to be integrated into operation with APHIS ADC assistance and training; and (3) purchase and use an Electronic Guard strobe-siren device.

An Agreement for Control of Animals on Private Property was completed. The agreement authorized control activities on the property and described the control methods to be used. Direct control services provided by APHIS ADC personnel were (1) calling and shooting, and (2) neck-snaring of coyotes in pasture fences. Leghold trapping was suspended because of inadequate availability of APHIS ADC or farm personnel to ensure that traps

would be checked on a daily basis, as required by law. On the third calling attempt, the APHIS ADC specialist called and shot an adult male coyote.

6. Monitor and Evaluate Results of Control Actions

During the following month, six more sheep were killed by coyotes. Two female coyotes were snared following the completion of fence construction, and no further livestock losses were reported. The APHIS ADC specialist provided the producer with educational literature and videotapes regarding livestock guarding dogs, coyote calling and snaring, as well as an "Electronic Guard" strobe-siren device.

7. End of Project

At the end of March, APHIS ADC involvement was terminated. All information regarding APHIS ADC actions and animals removed was reported as required by APHIS ADC policy.

D. Cattle Egret Rookery (Residential, Texas)

1. Receive Request for Assistance

APHIS ADC received a request from the county health department for assistance with the dispersal of a cattle egret rookery.

2. Assess Problem

The APHIS ADC specialist considered the following types of questions during his initial evaluation:

- Is the problem within the purview of APHIS ADC?
- Where exactly did the damage occur?
- Is a cooperative agreement in effect for APHIS ADC to provide control assistance for this type of problem in this area?
- Does APHIS ADC have expert personnel available to visit the damage site to confirm the damage, formulate control strategy, and carry out the control?
- Who can provide more information? Where and when can APHIS ADC personnel contact them?
- What is the history of the rookery, and how long has it been formed for this year?
- What health risks have been identified with this rookery?

The results of the assessment follow.

a. Type of Damage

Local residents complained of odor and noise associated with a cattle egret rookery in the neighborhood. Several neighborhood children were observed playing within the rookery area.

b. Location

The rookery was located within the city limits, on privately owned land, on a 19-acre woodlot that adjoined residential areas. The lot had a heavy growth of trees and shrubs.

The nests were confined to approximately three acres within the 19-acre tract. The rookery was not associated with aquatic habitat.

c. Site Visit

A survey by APHIS ADC personnel of the rookery site revealed that the rookery primarily posed a nuisance problem to local residents. The potential for disease-related problems existed; however, no determination concerning a human health or safety hazard was made.

d. Responsible Species

The problem was identified as a damage/nuisance complaint resulting from a cattle egret rookery.

e. Previous control

None. This was the first report of a cattle egret nesting activity or of a rookery in the area.

f. Assessment

This problem was within the purview of APHIS ADC. APHIS ADC agreed to provide assistance.

3. Evaluate Wildlife Damage Control Methods

The APHIS ADC specialist evaluated the potential damage control methods to determine which methods were applicable (see Table N-3). The basis for selection or rejection of the control methods and the results of the evaluation follow.

a. Legal, Administrative

(1) Lethal methods

Cattle egrets are protected under the Migratory Bird Treaty Act. USFWS permits are required to take this species or damage their eggs and nests.

(2) Frightening devices

City ordinance prohibited the use of certain frightening devices, including pyrotechnics, within the city limits and would have required special approval from city officials.

b. Environmental Considerations

(1) Biological

The nuisance problem was seasonal and was a result of nesting activities of the cattle egret. Nesting activity had been under way for several weeks, and the nests held eggs and young. Young egrets usually fledge by the middle of September. Continued use of the rookery site was dependent on heavy cover at the site. The rookery would likely continue to grow in size unless dispersed. No threatened or endangered species were observed in the area. However, if such species had been found at or near the rookery, consultation with USFWS would begin.

Table N-3

Selection of Control Methods for Cattle Egret Rookery (Residential, Texas)[a]

Potential Damage Control Method	Basis for Selection or Rejection
Resource Management	
Modification of Human Behavior:	
Alter aircraft flight patterns	Not applicable
Wildlife Management	
Habitat Modification:	
Eliminate or modify vegetation	Not applicable; vegetation was not the cause of the problem
Eliminate standing water	Not applicable; the rookery was not associated with aquatic habitat
Roost thinning or removal	Applicable
Frightening Devices:	
Electronic distress sounds	Not practical at this time; possible future use prior to nest building; will require city approval
Propane exploders	do.
Pyrotechnics	do.
Water spray devices	Not practical because of the large size of the rookery
Harassment	Not applicable
Other scaring devices—	
Eye-spot balloons	Not practical because of the large size of the rookery
Kill or Relocation:	
Shooting—	
Shooting on sight	Not applicable; according to existing statutes cannot be used unless the rookery poses a human health and safety hazard
Egg and nest destruction	do.
Removal of hatchlings	do.

[a] A detailed description of methods of control is given in Appendix J. See also the description of the APHIS ADC Decision Model in Chapter 2.

(2) Sociocultural

The rookery received media exposure, and any disturbance of the rookery or use of lethal control methods would have likely resulted in considerable public opposition. Any attempt to resolve the problem would have to be carried out after the birds had dispersed at the completion of the nesting season. Drought conditions made the use of pyrotechnics an extreme fire hazard, and the use of other scaring devices, such as propane cannons, would have created an unacceptable disturbance in the neighborhood.

(3) Economic

Future existence of the rookery would have a major impact on local residents. If the rookery were not dispersed, it could have serious economic impacts on local residents. Human health and safety could become a concern, and odor and noise problems could become serious enough to force residents to relocate. Also, thinning of the rookery site would be at the landowner's expense and was an economic consideration.

(4) Physical

The area was easily accessible; however, the large size of the woodlot would have made the use of scaring devices very difficult. If scaring devices had been used, a large amount of equipment and personnel would have been required to effectively cover the area.

c. Applicable Methods

Based on the evaluation, the following methods were considered as practical control methods: habitat modification; and frightening devices for possible future use, including electronic distress sounds, propane exploders, and pyrotechnics.

4. Formulate Control Strategy

The APHIS ADC specialist, the private landowner, the health department, and other local officials met to develop a control strategy for the damage problem. The control strategy was formulated as a result of the step III evaluation. Control efforts were delayed until the young birds had fledged. However, plans to prevent future use of the area as a rookery required immediate attention.

The following methods received consideration:

- Habitat Modification. Out of all the practical methods, habitat modification was chosen as the best habitat management plan. Thinning of cover on the entire lot, rather than removal, was suggested because thinning would prevent future use of the site as a rookery but was less expensive than complete clearing.
- Frightening Devices. Frightening devices, including electronic distress sounds, propane exploders, and pyrotechnics, received secondary consideration because of legal constraints and questionable long-term effectiveness.

Key factors considered for selection of the best control technique included the cost and time period for completion of work. Clearing the woodlot would be a considerable expense to the landowner because of the acreage involved and had to begin after the young birds had fledged. The strategy developed for this damage situation was an effective habitat modification plan (thinning of cover on the entire lot). Clearing the woodlot was to begin after the young birds had fledged (the middle of September) and prior to the return of nesting pairs the following spring.

5. Provide Assistance

APHIS ADC's role was that of providing damage assessment, technical assistance, and the loan of frightening equipment. The APHIS ADC representative communicated with concerned parties to provide details for implementing control techniques.

6. Monitor and Evaluate Results of Control Actions

APHIS ADC personnel monitored the rookery site for the remainder of the year to verify implementation of the selected control method, control method effectiveness, and need for additional APHIS ADC assistance.

7. End of Project

The project was completed when the rookery had been moved.

E. Cattle Egret Rookery (Airport, Arkansas)

1. Receive Request for Assistance

APHIS ADC received a request for assistance from the regional airport manager concerning a cattle egret rookery.

2. Assess Problem

The APHIS ADC specialist considered the following types of questions during his initial evaluation:

- Is the problem within the purview of APHIS ADC?
- Where exactly did the damage occur?
- Is a cooperative agreement in effect for APHIS ADC to provide control assistance for this type of problem in this area?
- Does APHIS ADC have expert personnel available to visit the damage site to confirm the damage, formulate control strategy, and carry out the control?
- Who can provide more information? Where and when can APHIS ADC personnel contact them?
- What is the history of the rookery, and how long has it been formed for this year?
- What health risks have been identified with this rookery?

The results of the assessment follow.

a. Type of Damage

The pilot of an air carrier reported striking three birds on a landing approach to a runway. No injuries occurred, and only minor damage to the air carrier was reported by the pilot. An accident report was filed with the Federal Aviation Association (FAA) Regional Office, followed by an ecological study as required under FAR 139.337. Four other near-miss air strikes with birds had been reported to the airport manager.

b. Location

The cattle egret rookery was located on airport property in a 10-acre pine/cedar thicket 500 yards from an airport runway. Nests were confined to four acres of the area closest to the runway; the rookery was confined within a fence surrounding airport property. The closest residential area was one-half mile away.

c. Site Visit

A survey by an APHIS ADC specialist of the airport rookery site revealed that cattle egrets and little blue herons were flying across runways primarily early and late in the day. The site was secluded from residential areas, so no nuisance complaints were anticipated. Although there was no chance of disease-related problems, air traffic safety was of primary concern. There were 15 to 20 commercial flights from regional airport to nearby international airports. Small commuter airplanes were the primary users of the airport, with most of the flights occurring in early morning and late afternoon.

d. Responsible Species

The rookery consisted of approximately 2,000 cattle egrets and 100 little blue herons. Eggs and nestlings of both species were present.

e. Previous Control

None. This was the first year a rookery was established at this site.

f. Assessment

This problem was within the purview of APHIS ADC. APHIS ADC agreed to provide assistance.

3. Evaluate Wildlife Damage Control Methods

The APHIS ADC specialist evaluated the potential damage control methods (see Table N-4) to determine which methods were applicable. The basis for selection or rejection of the control methods and the results of the evaluation follow.

a. Legal, Administrative

(1) Lethal methods

Cattle egrets and little blue herons are protected under the Migratory Bird Treaty Act. USFWS permits are required to take these species or damage their eggs and nests. In this scenario it was determined by FAA officials and the airport manager that the rookery posed a human safety hazard.

(2) Frightening devices

City ordinance prohibited the use of pyrotechnics within the city limits, and special approval from city officials would have to be obtained.

b. Environmental Considerations

(1) Biological

The safety problem was seasonal and was the result of nesting activities of the cattle egret and little blue heron. Nesting activity had been under way for several weeks, and the nests held eggs and young. Young egrets usually fledge by the middle of September. Continued use of the rookery site was dependent on heavy cover at the site. The rookery would likely continue to grow in size unless dispersed. No threatened or endangered species were observed in the area. However, if such species had been found at or near the rookery, consultation with USFWS would begin.

(2) Sociocultural

The rookery received little exposure, and most of the public was unaware that the problem existed. No media contacts had been made. However, before control was begun, the media was informed as to the proposed control methods.

(3) Economic

The most serious economic consideration was damages that would be incurred should there be an air strike with a bird/birds, which could cause loss of life or injuries to aircraft passengers. Lawsuits resulting from such an accident could cost the airport and the air carrier millions of dollars. Direct costs of damage to airplanes resulting from air strikes

Table N-4

Selection of Control Methods for Cattle Egret Rookery (Airport, Arkansas)[a]

Potential Damage Control Method	Basis for Selection or Rejection
Resource Management	
Modification of Human Behavior:	
Alter aircraft flight patterns	Not practical; the proximity of the rookery to the airport affected all possible flight patterns
Wildlife Management	
Habitat Modification:	
Eliminate or modify vegetation	Applicable
Eliminate standing water	Not applicable; the rookery was not associated with aquatic habitat
Roost thinning or removal	Applicable
Frightening Devices:	
Electronic distress sounds	Applicable, if used in combination with depredation permit and habitat modification
Propane exploders	do.
Pyrotechnics (shotguns)	do.
Water spray devices	Not practical because of the large size of the rookery
Harassment	Not applicable
Other scaring devices—	
Eye-spot balloons	Not practical because of the large size of the rookery
Kill or Relocation:	
Shooting—	
Shooting on sight	Applicable, if combined with scare tactics and habitat modification
Egg and nest destruction	do.
Removal of hatchlings	do.

[a] A detailed description of methods of control is given in Appendix J. See also the description of the APHIS ADC Decision Model in Chapter 2.

also be considered. Several economic side effects could also result if the problem persisted and carriers were forced to reroute their flights to other airports.

(4) Physical

The rookery site was easily accessible, with a runway on one side and an access road on the other. The large size of the rookery made use of scare tactics difficult, but equipment and manpower were available through airport personnel. In order to obtain long-term success in dispersing the rookery, it was necessary to modify the present rookery habitat. By removing the majority of the birds, the site would be made less attractive to the birds and force them to relocate to a more tolerable area.

c. Applicable Methods

Based on the evaluation, the following methods were considered as practical control methods: habitat modification; frightening devices, including electronic distress sounds,

propane exploders, and pyrotechnics; and kill or relocation, including shooting, egg and nest destruction, and removal of hatchlings.

4. Formulate Control Strategy

The APHIS ADC specialist and the airport manager met to develop a control strategy for the damage problem. The control strategy was formulated as a result of the step III evaluation. The APHIS ADC specialist and the airport manager also met with local media representatives at a prearranged media conference to discuss the dilemma and proposed control strategies.

It was determined that the problem needed to be resolved as soon as possible to prevent further chances of air strikes, resulting in possible fatalities. It was decided that the best control strategy would be to combine the use of frightening devices and habitat modification. Emergency authorization of a depredation permit, which would allow the removal of rookery vegetation during the nesting season and would approve the use of scaring devices on nesting birds, was required from USFWS by the airport manager. Authority was requested to shoot persistent adult birds. Strategies for preventing future rookery development were considered.

Frightening devices, including pyrotechnics, would be used to disperse persistent birds. All existing nests would be destroyed as requested in the depredation permit. To prevent future rookery formation, vegetation was thinned in the rookery and surrounding thicket.

5. Provide Assistance

APHIS ADC's role was that of providing damage assessment, technical assistance, and the loan of frightening equipment. The APHIS ADC representative communicated with concerned parties to provide details for implementing control techniques. An operational program was conducted by airport employees and contractors, with technical supervision by APHIS ADC under a cooperative field agreement. APHIS ADC personnel assisted in the removal of 200 cattle egrets, 10 little blue herons, and the destruction of 300 nests.

6. Monitor and Evaluate Results of Control Actions

APHIS ADC assisted the airport personnel in tabulating the number of birds killed and nests destroyed to help fulfill reporting guidelines within the USFWS depredation permit. APHIS ADC and airport personnel monitored the rookery site for the remainder of the year to verify implementation of the selected control method, control method effectiveness, and need for additional APHIS ADC assistance. APHIS ADC contracted with the airport to conduct an ecological study to determine bird hazards at the airport and to develop a bird hazard management plan under a cooperative funding agreement.

7. End of Project

The number of birds using the rookery was reduced sufficiently to alleviate the problem. No further assistance was provided.

F. Beaver Damage Control (Rural, Texas)

1. Receive Request for Assistance

A Texas landowner contacted the APHIS ADC Office to report that his hay meadow had been flooded. He reported that about 15 acres were under water and that several trees along the perimeter of the flooded pasture had been girdled. The landowner determined that the high water was the result of a series of dams that were built downstream from his hay meadow. He suspected the problem species to be nutria and asked if APHIS ADC could be of assistance in removing the dam and the damaging animals.

2. Assess Problem

The APHIS ADC specialist considered the following types of questions during his initial evaluation:

- Is the problem within the purview of APHIS ADC?
- Where exactly did the damage occur?
- Is a cooperative agreement in effect for APHIS ADC to provide control assistance for this type of problem in this area?
- Does APHIS ADC have expert personnel available to visit the damage site to confirm the damage, formulate control strategy, and carry out the control?
- Who can provide more information? Where and when can APHIS ADC personnel contact them?

The results of the assessment follow.

a. Type of Damage

Damage to hay meadow caused by flooding of a creek and damage to hardwood timber.

b. Location

The damage site was located on a private farm in rural Texas. Dams had been built on a creek about one-fourth mile downstream from a hay meadow.

c. Site Visit

A site visit was conducted by an APHIS ADC specialist. He ascertained that the damaging species was beaver, not nutria. A series of three dams built on the creek by beavers had raised the water level to the point of flooding the hay meadow. The landowner had approximately 15 acres of hardwood timber on his property. Beavers had girdled or cut down a total of 15 oak trees along the perimeter of the flooded pasture. Further inspection also revealed that approximately 10 acres of hardwood timber had been flooded as a result of the dams constructed by the beavers. The landowner informed the APHIS ADC specialist that he had not inspected the area for about two months and, therefore, had just become aware of the problem.

d. Responsible Species

The problem species causing the damage was identified as beaver.

e. Previous Control

The landowner had broken one of the dams in an attempt to lower the water level, but the beavers repaired the dam within 24 hours. No other control measures had been attempted by the landowner.

f. Authorization/Existing Agreement

There is a cooperative agreement in existence, and Texas law authorizes the State to enter into a cooperative agreement for the Federal APHIS ADC Program for the protection of the well-being and the property of the citizens of the State from damage caused by predatory animals and rodents in rural and urban areas.

g. Assessment

The problem was in the purview of APHIS ADC. APHIS ADC personnel agreed to provide control assistance.

3. Evaluate Wildlife Damage Control Methods

The APHIS ADC specialist evaluated all possible control methods (see Table N-5) to determine which methods were applicable. The basis for selection or rejection of the control methods and the results of the evaluation follow.

a. Legal, Administrative

There were no legal or administrative constraints that would restrict the use of available control methods.

b. Environmental Considerations

(1) Biological.

The beaver population on the site and surrounding counties was increasing. The increase had been documented through surveys of streams, rivers, impoundments, and reservoirs by APHIS ADC personnel. Requests for damage management assistance were also increasing. If the beavers were allowed to remain at the site, the site would have been drastically altered (i.e., loss of valuable trees and loss of improved hay pasture). Beavers had apparently moved into the location several months earlier; well-established feeding areas, trails, slides, and territorial markings were noted at the site. Adult beavers at the site had probably produced young, making it highly unlikely that they could be moved by removing the dam or disturbing the lodge. Potential beaver food sources of trees, shrubs, and shoreline vegetation were abundant. A well-established beaver lodge was located in the creek bank. No threatened or endangered species were observed in the area. However, if such species had been found at or near the rookery, consultation with the USFWS would begin.

(2) Sociocultural.

Loss of the hardwood timber on the landowner's property would have resulted in a decrease of desirable wildlife species attracted to the food and cover the timber provided. Local residents recognized the need to develop a beaver damage management plan to limit future beaver damage in the area. Four landowners downstream and one landowner upstream from the damage site had reported damage during the past two years. The landowner and adjoining landowners had no objection to the use of available control methods.

Table N-5

Selection of Control Methods for Beavers (Rural, Texas)[a]

Potential Damage Control Methods	Basis for Selection or Rejection
Physical Barriers	
Sheathing:	
Tree protectors	Not applicable to current damage; could prevent future tree damage, but large number of trees make this method impractical; will not eliminate flooding problem; possible future use
Wildlife Management	
Habitat Management:	
Manipulation of water level	Not applicable; controlled water level can sometimes be achieved when potential dam sites are limited; unlimited potential dam sites in this situation; 3 dams already constructed
Dam removal	Applicable; landowner removed one dam but was rebuilt by beavers; dams can only be removed after removal of beavers; removal of dams may be by hand or explosives
Chemical repellents	Not applicable; none currently registered for use on species
Kill or Relocation:	
Leghold traps	Applicable; highly effective and selective
Cage traps	Not practical; not as effective as other traps, therefore not recommended
Snares—	
Neck snares	Applicable; selective and effective
Quick-kill traps	Applicable; highly effective and selective
Shooting—	
Spotlighting and shooting	do.
Shooting on sight	Applicable; highly selective

[a] A detailed description of methods of control is given in Appendix J. See also the description of the ADC Decision Model in Chapter 2.

The use of nonlethal methods, as recommended, may limit the need for the use of lethal control in dealing with future beaver damage situations in the area. A timber cruise completed by an area forester six months earlier provided an estimate of 5,600 board feet of hardwood timber per acre. At the current market value of $65/thousand board feet, potential loss of timber from flooding was estimated at $3,640.

(3) Economic.

Flooding of the hay meadow would have the most important impact on the landowner. Damage at this site from lost hay production was estimated at $1,100. Beaver damage in the area had been extensive during the past two years. A review of APHIS ADC beaver damage reports showed over $15,000 in damage to timber and property within a 10 mi^2 area surrounding the damage site. Damage to hardwood timber was minimal at the time the inspection was made. However, if the beavers continued to flood the area and damage trees by girdling and cutting them down, damage costs could become substantial. Also, additional damage to the hay meadow would occur, resulting in a loss of hay production and eventual loss of improved pasture.

The APHIS ADC specialist assigned to the area holds a State-funded position. The position is one of several State-funded positions providing public assistance with damage caused by wildlife. As a result of the extensive beaver damage in the area, one of the primary responsibilities of the APHIS ADC specialist is beaver damage control. The extent and type of damage and damage location, as well as the expertise and equipment required, indicate that damage control work at this site can best be accomplished by the APHIS ADC specialist.

(4) Physical.

There were no physical considerations that would preclude the use of practical control methods. Location of the damage site was such that removal of the dams without removal of the beavers was not an effective option. The creek had low banks, causing small dams to seriously impede water flow and create serious flooding and there were many potential sites for beavers to construct dams. Water flow could not be controlled effectively without removal of the dams.

c. Applicable Methods

Based on the evaluation, the following control methods were considered as practical: tree protectors, dam removal, leghold traps, neck snares, quick-kill traps, spotlighting and shooting, and shooting on sight.

4. Formulate Wildlife Damage Control Strategy

The APHIS ADC specialist and the landowner met to develop a control strategy for the damage problem. The control strategy was formulated as a result of the step III evaluation. Options considered were (A) technical assistance, and (B) direct control, including nonlethal methods and other methods. In the final selection of the methods, effectiveness was a consideration.

a. Technical Assistance

To discourage future use of the site by beavers, the following practical technical assistance options were recommended: (1) Closely observe the site so that future use by beavers can be dealt with before the beavers become well established. If dam-building activity is observed, remove the dam(s) immediately to discourage continued use of the site. (2) Consider wrapping valuable trees with sheathing to further discourage use of the site and prevent tree damage.

b. Direct Control

(1) Nonlethal Methods.

Nonlethal methods were given primary consideration. However, no practical, nonlethal methods were available other than those already considered in connection with technical assistance. Nonlethal control methods may be useful in discouraging future use of the site by beavers.

(2) Other Methods.

Control operations would begin immediately by placing quick-kill traps at the lodge entrance. APHIS ADC would return to the site one-half hour before sunset in order to spotlight and shoot beaver. The following day APHIS ADC would return to assess the effectiveness of the control operations. If all beavers had been removed, the main dam

would be removed by APHIS ADC personnel using binary explosives. Smaller dams would be removed by the landowner by hand.

c. Decision

An Agreement for Control of Animals on Private Property was completed. The agreement authorized control activities on the property and described the control methods to be used.

5. Provide Assistance

Because of the extent of damage, the need for immediate relief, and the skill required to apply control methods, the landowner and the APHIS ADC specialist agreed that the problem beavers and their dams should be removed and that control operations would best be carried out by APHIS ADC.

Technical assistance was provided to the landowner based on the circumstances surrounding the damage situation. The APHIS ADC specialist informed the landowner that he would return two weeks later to inspect the site, check for beaver activity, and confirm the success of the project.

6. Monitor and Evaluate Results of Control Actions

The APHIS ADC specialist returned two weeks later and determined that all the beavers had been removed from the site and water flow was normal. Technical assistance recommendations were reviewed with the landowner. The landowner was advised that if additional assistance was needed, he could contact the APHIS ADC specialist.

7. End of Project

The project ended after the return visit.

G. Beaver Damage Control (Urban, Texas)

1. Receive Request for Assistance

The maintenance department of a Texas university contacted APHIS ADC office to request assistance with resolving a beaver damage problem. It was reported that beavers were damaging bald cypress trees that had been planted as part of a landscaping project adjacent to a waterway that ran through the grounds of the university. Trees had been destroyed, presumably by beavers.

2. Assess Problem

The APHIS ADC specialist considered the following types of questions during his initial evaluation:

- Is the problem within the purview of APHIS ADC?
- Where exactly did the damage occur?
- Is a cooperative agreement in effect for APHIS ADC to provide control assistance for this type of problem in this area?

- Does APHIS ADC have expert personnel available to visit the damage site to confirm the damage, formulate control strategy, and carry out the control?
- Who can provide more information? Where and when can APHIS ADC personnel contact them?

The results of the assessment follow.

a. Type of Damage

Beaver damage to bald cypress trees.

b. Location

The damage site was located within a landscaped area along a waterway that ran through the campus grounds.

c. Site Visit

A program specialist from APHIS ADC met with the groundkeeper of the institute to inspect the damage site. He confirmed that the damaging species was beaver. The area of the damage site was frequented by employees and students of the university and local residents. There were several pathways regularly used by the public that led along the waterway. Beavers had recently cut down two bald cypress trees and girdled a third. Other than the recent damage to these trees, there was no indication of previous beaver activity.

d. Responsible Species

The problem species causing the damage was identified as beaver.

e. Previous control

No effort to control the damage had been made.

f. Authorization/Existing Agreement

There is a cooperative agreement in existence, and Texas law authorizes the State to enter into a cooperative agreement with the Federal APHIS ADC Program for the protection of the well-being and the property of the citizens of the State from damage caused by predatory animals and rodents in rural and urban areas.

g. Assessment

The problem was in the purview of APHIS ADC. APHIS ADC personnel agreed to provide control assistance.

3. Evaluate Wildlife Damage Control Methods

The APHIS ADC specialist evaluated all possible control methods (see Table N-6) to determine which methods were applicable. The basis for selection or rejection of the control methods and the results of the evaluation follow.

Table N-6

Selection of Control Methods for Beavers (Urban, Texas)[a]

Potential Damage Control Methods[b]	Basis for Selection or Rejection
Physical Barriers	
Sheathing:	
Tree protectors	Applicable; only 3 small trees had been damaged; size and number of trees to be protected indicated that further damage could be prevented if vulnerable trees were protected with sheathing
Wildlife Management	
Habitat Management:	
Manipulation of water level	Not applicable; no beaver dams associated with the damage site
Dam removal	Not applicable; no dams
Chemical Repellents	Not applicable; no chemical repellents currently registered for use on beavers
Kill or Relocation:	
Leghold traps	Not applicable; technical assistance and nonlethal control were given primary consideration; capture or lethal control not necessary to prevent further damage
Cage traps	(Same)
Snares—	
Neck snares	do.
Quick-kill traps	do.
Shooting—	
Spotlighting and shooting	do.
Shooting on sight	do.

[a] A detailed description of methods of control is given in Appendix J. See also the description of the APHIS ADC Decision Model in Chapter 2.

a. Legal, Administrative

City ordinance prohibited the use of traps, snares, and firearms within the city limits. Even though permission to use these devices could probably have been obtained from the city, these methods were not deemed necessary to manage the current problem.

b. Environmental Considerations

(1) Biological.

Beavers inhabited most of the waterways in the immediate vicinity. There was an increase in reports of beaver activity and damage, and the beaver population was increasing steadily in the area as indicated by surveys of available habitat. The damage site was not particularly attractive to beavers as a lodging area. Therefore, damage at the site was likely the result of a single transient beaver temporarily using the site. No established feeding areas, trails, slides, or territorial markings were noted. No threatened or endangered species

were observed in the area. However, if such species had been found at or near the site, consultation with USFWS would begin.

(2) Sociocultural.

Because local residents and students frequented the area of the damage site, the choice of damage control methods was limited to techniques that presented no danger to users of the grounds and their pets.

It was also important to achieve immediate and long-term success of the control methods to be used in order to prevent further loss of trees and maintain the aesthetic value of the park-type setting.

(3) Economic.

No serious economic loss had occurred at the time of the site inspection. Damage at the site was minimal. The damaged trees were small and could be replaced with little loss in growth years.

The APHIS ADC specialist assigned to the area holds a State-funded position. The position is one of several State-funded positions providing public assistance with damage caused by wildlife. As a result of the extensive beaver damage in the area, one of the primary responsibilities of the APHIS ADC specialist is beaver damage control. The extent and type of damage and damage location and the expertise and equipment required indicate that damage control work at this site can best be accomplished by the APHIS ADC specialist.

(4) Physical.

No physical considerations precluded the use of practical control methods. There were no beaver dams or lodges associated with the damage site.

c. Applicable Methods

Based on the evaluation, the following method was considered: the use of tree protectors.

4. Formulate Wildlife Damage Control Strategy

The APHIS ADC specialist met with the maintenance department representative of the university to discuss APHIS ADC's findings and the control strategy for the damage problem. The control strategy was formulated as a result of the step III evaluation. Based on the evaluation of available management options, only a nonlethal method was considered as the preferable damage control method. In the final selection of the method, effectiveness was a consideration.

The use of tree protectors was recommended by the APHIS ADC specialist. APHIS ADC would provide technical assistance and advice on their use to prevent future damage by beavers. Maintenance personnel of the university would be advised how to apply tree protectors, and the APHIS ADC specialist would designate those trees particularly vulnerable to beaver damage.

5. Provide Assistance

This project involved technical assistance information only and did not involve the direct application of management methods by APHIS ADC personnel.

The APHIS ADC specialists met with maintenance employees and provided details on the application and design of tree protectors. Protectors were to be constructed of chicken wire to make them as inconspicuous as possible. They were to be applied immediately to avoid further damage. APHIS ADC advised the maintenance employees that he would return to the damage site the following week to inspect the tree protectors for proper construction and application and to check for beaver activity.

6. Monitor and Evaluate Results of Control Actions

The APHIS ADC specialist returned to the damage site one week later and made an inspection of the tree protectors. The protectors had been constructed and applied as directed by the APHIS ADC specialist. The specialist found signs of recent beaver activity; however, no further damage to trees in the area had occurred. No further assistance was required.

7. End of Project

The project ended after the return visit.

H. Blackbird Roost (School, Kentucky)

1. Receive Request for Assistance

APHIS ADC received a request from a city health department for assistance with a blackbird roost. A human health risk associated with the roost prompted the request.

2. Assess Problem

The APHIS ADC specialist considered the following types of questions during his initial evaluation:

- Is the problem within the purview of APHIS ADC?
- Where exactly did the damage occur?
- Is a cooperative agreement in effect for APHIS ADC to provide control assistance for this type of problem in this area?
- Does APHIS ADC have expert personnel available to visit the damage site to confirm the damage, formulate control strategy, and carry out the control?
- Who can provide more information? Where and when can APHIS ADC personnel contact them?
- What is the history of the roost, and how long has it been formed for this year?
- What health risks have been identified with this roost?

The results of the assessment follow.

a. Type of Damage

Several children and residents of a subdivision had contracted histoplasmosis associated with a blackbird roost. Results from a test of the roost were positive.

b. Location

The roost was located on private property adjacent to an elementary school and subdivision within the city limits. The size of the roost was 14 acres. The primary vegetation in the roost area was cedar measuring 8 to 15 feet in height; some hardwoods and brush were also interspersed throughout the roost. A small stream flowed through the roost.

c. Site Visit

A site visit by an APHIS ADC specialist revealed that there was a blackbird roost consisting of approximately 500,000 birds. Besides creating a public nuisance to residents of the subdivision, the roost was a health risk.

d. Responsible Species

The species of birds using the roost were common grackles (86 percent), red-winged blackbirds (10 percent), European starlings (4 percent), and American robins (less than 1 percent).

e. Previous Control

None.

f. Authorization/Existing Agreement

A depredation order exists for blackbirds, cowbirds, grackles, crows, and magpies, authorizing the control of listed species without a Federal permit when found committing or about to commit depredations upon ornamental or shade trees, agricultural crops, livestock, or wildlife or when concentrated in such numbers and manner as to constitute a health hazard or other nuisance (50 CFR 21.43).

g. Assessment

The problem was within the purview of APHIS ADC. APHIS ADC agreed to provide assistance.

3. Evaluate Wildlife Damage Control Methods

The APHIS ADC specialist evaluated the potential damage control methods (see Table N-7) to determine which methods were applicable. The basis for selection or rejection of the control methods and the results of the evaluation follow.

a. Legal, Administrative

There were no administrative constraints that would restrict the use of any of the potential control methods. APHIS ADC Directives (1.005) require that nonlethal methods be considered before lethal methods, when practical. In this situation, all practical methods were nonlethal. APHIS ADC Directives (4.001) also require that technical assistance be given primary consideration.

The discharge of firearms is prohibited within the city limits. The chemical toxicants DRC-1339 and Starlicide are not registered for use in roosts. PA-14 could not be applied to this roost because of the risk of contaminating the stream that flowed through the roost area.

Table N-7

Selection of Control Methods for Blackbird Roost (School, Kentucky)[a]

Potential Damage Control Method	Basis for Selection or Rejection
Resource Management	
Crop Selection and Planting Schedules	Not applicable to a roost
Modification of Human Behavior:	
Alter aircraft flight patterns	do.
Physical Barriers	
Netting	Not applicable because of the large size of the roost and the potential cost to implement these methods
Porcupine Wire	do.
Wildlife Management	
Habitat Management:	
Eliminate or modify vegetation	Not applicable; vegetation was not the cause of this problem
Eliminate standing water	Not applicable; water was not the cause of this problem
Roost thinning or removal	Applicable
Close garbage dump	Not applicable for this situation
Manipulation of water level	Not applicable; water was not the cause of this problem
Lure Crops/Alternate Foods	Not applicable to a roost
Frightening Devices:	
Electronic distress sounds	Applicable
Propane exploders	Applicable
Pyrotechnics	Applicable; city had approved use for this project
Water spray devices	Not practical for this situation because of the large size of the roost
Harassment	Not applicable
Other scaring devices—	
Eye-spot balloons	Applicable
Effigies	Not practical; the roost was too large and this method is generally not effective for roosts
Chemical Repellents:	
Tactile	Not practical; the roost was too large to cover limbs with a tactile repellent
Frightening agents (Avitrol)	Not applicable; Avitrol is registered for the species but is used with bird feeding, not with roosting behavior
Kill or Relocation:	
Cage traps	Not applicable; too many birds were present for this method to be effective
Shooting—	
Shooting on sight	Not applicable; city ordinance prohibits; proximity of subdivision also prohibites use
Chemical toxicants—	
DRC-1339	Not applicable; this avicide is not registered for use in roosts
Starlicide	do.
PA-14	Not applicable; the label prohibits contamination of aquatic environments

[a] A detailed description of methods of control is given in Appendix J. See also the description of the APHIS ADC Decision Model in Chapter 2.

b. Environmental Considerations

(1) Biological

The roost was a seasonal occurrence. Unless the site was modified, the roost was expected to re-form annually. No threatened or endangered species were observed in the area. However, if such species had been found at or near the site, consultation with USFWS would begin.

(2) Sociocultural

Because of the health threat associated with the roost, immediate action was necessary. The health department, school district, and residents of the subdivision were in agreement on eliminating the roost through any feasible means. However, there was expected adverse reaction from others not living close to the roost.

(3) Economic

If the roost were not dispersed, it could have serious economic impacts on local residents. Human health and safety was a concern, and conditions could become serious enough to force residents to relocate. Funds for eliminating the roost were available from the city government; therefore, there would be no financial expense to local residents of the subdivision.

(4) Physical

Access to the site did not present a logistical problem. The presence of a stream precluded the use of a roost toxicant, but did not present a significant physical obstruction for the use of other nonchemical control techniques. There were no sites in the general area that could serve as an alternate roost. Even though there was a lack of alternate roost sites in the vicinity of the subdivision, the birds could relocate if disrupted.

c. Applicable Methods

Based on the evaluation, the following methods were considered as practical control methods: (1) roost thinning or removal; (2) distress calls; (3) propane cannons; 4) pyrotechnics; and (5) eye-spot balloons.

4. Formulate Control Strategy

Health department officials and the landowner met with the APHIS ADC specialist to formulate a strategy to resolve the problems associated with the roost.

Because the health department had lacked experience with roost control methods, the health department did not attempt to relocate or eliminate the roost. APHIS ADC personnel had the available expertise to recommend and/or implement practical control methods.

A specific agreement was not required with the health department since APHIS ADC personnel only provided technical assistance and oversight and lent the city pyrotechnics. City employees conducted all the work, and all the expenses of the project were borne directly by the city. APHIS ADC supplies and equipment used in the project were replaced or returned by the city.

The strategy adopted for this damage situation included two major components: First, the birds would be caused to move; second, the trees in the roost area would be thinned or removed to prevent the roost from reforming in subsequent years.

Notification of the planned control project was given to the police and fire departments by the health department. The media also were notified of the plan and given the reason for the project, a description of the methods that would be employed, and a schedule of the planned activities.

5. Provide Assistance

On the day before the control plan began, the appropriate city employees were trained by an APHIS ADC specialist in the proper use of scaring devices (distress calls, propane cannons, pyrotechnics, and eye-spot balloons). The employees were instructed to reserve use of the balloons until the second night of the control project to reinforce the harassment program. APHIS ADC personnel supervised the project for the first three nights.

6. Monitor and Evaluate Results of Control Actions

Bird movements were monitored to assure that the roost did not relocate to another populated area. After roosting birds were removed, APHIS ADC personnel returned to advise the landowner and city officials how to selectively thin the trees or clear the area to remove the potential for a roost to reform in future years.

7. End of Project

The project ended after the return visit. Because the roost site tested positive for histoplasmosis, APHIS ADC personnel recommended that the responsible public health agency take appropriate action (roost decontamination, posting health warnings, or preventing access).

I. Managing Starling Populations (Dairy Farm, Vermont)

1. Receive Request for Assistance

APHIS ADC office in Vermont received a request for assistance in managing sanitation problems caused by European starlings (*Sturnus vulgaris*) from a Vermont dairy farmer. The request was prompted by a concern over health risks to livestock and farm workers and a loss of livestock feed.

2. Assess Problem

Vermont APHIS ADC biologists considered the following questions during the initial evaluation:

- Is the problem within the purview of APHIS ADC?
- What is the damage history at the site?
- What is the extent and nature of the damage?
- Is a cooperative agreement in effect for APHIS ADC to provide control assistance for this type of problem in this area?
- Can this situation be addressed by existing expertise from the Vermont APHIS ADC program?
- Are there additional risks associated with the situation?

a. Type of Damage

A Vermont dairy farmer contacted APHIS ADC biologists with concerns related to sanitation and feed loss associated with a flock of starlings at his free-stall dairy facility. Accumulation of droppings on barn structures and livestock as well as in livestock feed were considered to pose a health risk to the livestock and farm workers. Also, the farmer was concerned about the amount of feed the birds were consuming.

b. Location

The dairy farm is located in an agricultural area in northeastern Vermont. Other farms are in the area, but the birds concentrated at this farm. The farm is adjacent to a heavily traveled road and is approximately 4 miles from the nearest town.

c. Site Visit

APHIS ADC biologists evaluated the situation and determined that the size of the flock and extent of current damage warranted action. Observations indicated a flock size of approximately 300 starlings. The birds preferred to loaf in the rafters and forage in the cattle feed troughs. The starlings did not roost at this site. The roost was believed to be located in adjacent woodlots and other farm buildings in the area.

d. Responsible Species

A flock of European starlings consisting of approximately 300 birds was responsible for the damage.

e. Previous Control

Exclusionary techniques using 1-inch mesh chicken wire had been used to minimize bird access to the barn. However, this approach was not very effective at reducing risk or damage associated with birds. No other control had been used.

f. Authorization/Existing Agreement

Starlings are native to Europe and were introduced to the United States in 1890. They are not protected by Federal or Vermont law.

g. Assessment

The problem was within the purview of APHIS ADC. APHIS ADC agreed to provide direct assistance.

3. Evaluate Wildlife Damage Control Methods

APHIS ADC biologists evaluated potential damage control methods to determine practical management options (see Table N-8). The basis for selection or rejection of the control methods and the results of the evaluation follow.

a. Legal, Administrative

A pesticide use permit issued by the Vermont Department of Agriculture is required to use avicides. Vermont APHIS ADC notifies local landowners and the area Vermont Fish and Wildlife Department conservation officer of any proposed bird management involving avicides or pyrotechnics.

b. Environmental Considerations

(1) Biological

Starlings use the barn as an annual wintering area for feeding and loafing during periods of severe cold and snow cover. No threatened or endangered species were observed in the area. However, reduction of the starling population at this farm would occur during winter months when the problem is most severe to reduce any potential risks to nontarget wildlife species.

(2) Sociocultural

Health risks to livestock and farm workers warranted immediate action.

(3) Economic

The loss of livestock feed (high moisture silage) was considered a serious impact to the farmer's costs of production. The potential for increased veterinary costs was also a concern. Additional costs to exclude birds from the barn were not substantial, according to the farmer.

(4) Physical

The physical location of the farm did not present problems for managing starlings. However, farm management practices, such as the use of tractors and other farm equipment around the bait trays, challenged APHIS ADC's successful use of control techniques involving avicides.

c. Applicable Methods

Based on the evaluation of possible control options, the most practical methods for reducing damage associated with starlings was to reduce the population using the toxicant DRC-1339 and then follow this population reduction using appropriate exclusionary techniques. Because exclusionary techniques have limited effectiveness in preventing access of birds into the freestall dairy, population reduction of starlings using the barn will likely be necessary every 3 to 5 years. The application of DRC-1339, including prebaiting, disposal of dead birds and unused bait, and post-application evaluation, was performed by APHIS ADC. The farmer was responsible for installing 0.5-inch mesh netting in the barn to minimize future problems caused by birds.

4. Formulate Control Strategy

APHIS ADC biologists coordinated a prebaiting program with the farmer that allowed the birds ready access to the untreated grain bait during their normal feeding routine while not inhibiting daily farm management. Neighboring farms and, residents and the area Vermont Fish and Wildlife Department conservation officer were notified of the proposed management actions.

5. Provide Assistance

Prebaiting was conducted by APHIS ADC biologists in cooperation with the farmer for a period of 18 days. DRC-1339 was prepared according to label instructions and was distributed in the bait trays that had been used for prebaiting. Due to unpredictable weather and bird behavior, the application was monitored for a period of 15 days. The farm area was routinely scanned for bird carcasses. APHIS ADC continued to monitor the behavior of

the flock during the treatment period. APHIS ADC biologists provided technical assistance on exclusionary techniques for use on dairy farms.

6. Monitor and Evaluate Results of Control Actions

APHIS ADC monitored the starling population and maintained the DRC-1339 bait until management objectives were achieved.

7. End of Project

The starling population using the barn was reduced by 92 percent, and exclusionary techniques and changes in cultural practices were approved for a long-term solution.

Table N-8

Selection of Control Methods for Starlings (Dairy Farm, Vermont)[a]

Potential Damage Control Methods	Basis for Selection or Rejection
Resource Management	
Crop selection and plant schedules	Not applicable
Modification of human behavior	Applicable combined with other technique
Alter Aircraft Flight Patterns	Not applicable
Physical Barriers	
Netting	Applicable combined with other techniques
Porcupine	Not applicable due to feeding behavior
Wildlife Management	
Habitat Modification:	
Eliminate or modify vegetation	Not applicable
Eliminate standing water	Not applicable, water not a problem
Roost thinning or removal	Not applicable, not a roost
Close garbage dump	Not applicable, not present
Manipulation of water level	Not applicable , water not a problem
Lure Crops/Alternate Foods	Not applicable, would not be accepted by birds at farm
Frightening Devices:	
Electric distress sounds	Applicable, but noise may disturb livestock and the effectiveness of the method may be short-lived
Propane exploders	Not applicable in a barn
Pyrotechnics	Not applicable in a barn
Water spray devices	Not applicable in a barn
Harassment	Not applicable in a barn
Other scaring devices—	
Eye-spot balloons	Applicable
Effigies	Not application in an active dairy barn
Chemical Repellents:	
Tactile	Not practical due to location of feeding area on barn floor
Frightening agents (Avitrol)	Not practical
Kill or Relocation:	
Cage trap	Not applicable due to size and behavior of flock
Shooting—	
Shooting on sight	Not practical inside a barn
Chemical toxicants:	
DRC-1339	Applicable due to species and site characteristics
Starlicide	Not practical, pelletized baits would not be readily accepted by these birds
PA-14	Not applicable

[a] A detailed description of methods of control is given in Appendix J. See also the description of the APHIS ADC Decision Model in Chapter 2.

Appendix N, Part II

Cost Comparison of Program Alternatives

Cost Comparison of Program Alternatives

Part I of this appendix portrays the APHIS ADC decision model in various situations requiring wildlife damage control. The nine examples serve a second purpose in Part II, by providing a basis for comparing direct costs likely to be incurred under the five program alternatives. Assumptions regarding the course of action followed under each alternative are set forth (other than for the Current Program Alternative, described in Part I). Itemized costs to the public sector and to the affected party or parties are estimated, the sums of which are shown in Chapter 4, Table 4-40.

Example 1. Coyote Predation on Sheep Grazed on Public Land, Colorado

Alternative 1. No Action

Assumptions

1. The rancher turns to a State-administered wildlife damage control program for assessing the problem and carrying out damage control activities.
2. The State agency advises a course of action similar to that carried out by APHIS ADC under the Current Program Alternative.
3. The use of M-44 sodium cyanide ejectors is no longer available, since registration would not have been maintained.
4. The State-employed wildlife damage specialist shoots two of the coyotes, but the third coyote cannot be taken by an M-44 ejector, as in the Current Program Alternative, because this technique is not available. Sheep losses continue.

	Cost	Totals
Direct Cost to State-Administered Program		
- Initial 5-day site survey, for calling and shooting on three consecutive mornings, $128 per day	$ 640[1,2]	
- Two subsequent 5-day site visits, for calling and shooting the remaining coyote	1,280	
Public subtotal		$ 1,920
Direct Cost to Affected Party		
Damage		
- Initial loss of lambs, 2 @ $70	140	
- Subsequent loss of lambs, 5 @ $70	350	

(Continued)

1 The relatively isolated site requires at least a 3-day trip per visit (1 day traveling to the site and 1 day traveling back). Lethal methods are employed on the initial 5-day visit in order to control losses without delay.

2 Daily costs including administrative expenses are approximately $200. About 36 percent of program costs are currently borne by the State and county through cooperative funding agreements. Similarly, it is assumed for the No Action Alternative that $72 per day would be paid from producer-funded State and county associations and $128 per day would be borne directly by the State-administered program.

Alternative 1 (Continued)

	Cost	Totals
Damage control		
- Payment for services provided by the State	600[3]	
Cost to Other Ranchers		
Predator control program funds		
- ($72 per day) (15 days) minus $600	480[4]	
Affected Party subtotal		1,570
Total		$ 3,490

Alternative 2. Current Program (Coyote Predation on Sheep Grazed on Public Land, Colorado)

	Cost	Totals
Direct Cost to APHIS ADC and APHIS ADC-Supervised Programs		
APHIS ADC technical assistance and direct control		
- Initial 5-day site survey, for calling and shooting on three consecutive mornings, and setting M-44 sodium cyanide ejectors, $128 per day	$ 640	
- Four weekly, 3-day site visits, for advising on the acquisition and management of guard dogs, monitoring, and evaluation, $128 per day	1,536[5]	
Public subtotal		$ 2,176
Direct Cost to Affected Party		
Damage		
- Loss of lambs, 2 @ $70	140	
Damage control		
- Payment for services provided by APHIS ADC	600	
Cost to Other Ranchers		
Predator control program funds		
- ($72 per day) (17 days) minus $600	624	
Affected Party subtotal		1,364
Total		$ 3,540

3 This rancher's contributions to the State (25¢/head) and county (35¢/head) funds for predator control would total 60¢/head, or $600 for the 1,000 ewes he owns.

4 In this case, 15 days of assistance implies a payment of $1,080 from the State and county funds, or a net contribution of $480 by other ranchers to damage control efforts for this rancher. Contributions by other ranchers are similarly calculated for the other alternatives.

5 As a longer term means of controlling losses, the rancher is advised to acquire two guard dogs. Purchase and maintenance of a guard dog during the first year would cost about $830. Costs during the subsequent years would be about $280 per year. These costs of long-term damage control are not incurred in resolving the immediate problem and therefore not included in the scenario. However, over the long term, guard dogs do provide a cost effective solution to predation.

Alternative 3. Nonlethal Control Program (Coyote Predation on Sheep Grazed on Public Land, Colorado)

Variation 1: Nonlethal methods are successful

Assumptions

1. Appropriate nonlethal methods considered and their estimated costs:
   a. Employ a second herder, $1,500 per month for 6 months.
   b. Acquire two electronic guards (portable strobe light and siren) and two propane exploders, $1,200.
   c. Acquire two guard dogs, at a total first-year cost of about $1,660 and subsequent total costs of about $560 per year.
2. All of the nonlethal methods considered are employed at the expense of APHIS ADC. However, the guard dogs would not be used until the following year, and their cost is not included in this analysis.
3. Additional lambs are lost to coyotes until the more intensive herding and electronic guards become effective.

	Cost	*Totals*
Direct Cost to APHIS ADC and APHIS ADC-Supervised Programs		
APHIS ADC technical assistance		
- Initial 3-day site survey, followed up by 10 weekly 3-day visits, for moving the frightening devices, advising on the acquisition and management of the guard dogs, monitoring, and evaluation, $128 per day	$ 4,224	
- Employment of a second herder, at a cost of $1,500 per month for 2½ months	3,750	
- Two electronic guards and two propane exploders	1,200	
Public subtotal		$ 9,174
Direct Cost to Affected Party		
Damage		
- Initial loss of lambs, 2 @ $70	140	
- Subsequent loss of lambs, 5 @ $70	350	
Damage control		
- Payment for services provided by APHIS ADC	600	
Cost to Other Ranchers		
Predator control program funds		
- ($72 per day) (33 days) minus $600	1,776	
Affected Party subtotal		2,866
Total		$ 12,040

Alternative 3. Nonlethal Control Program (Coyote Predation on Sheep Grazed on Public Land, Colorado)

Variation 2: Nonlethal methods are not successful

Assumptions

1. The same decision process is followed as in the first variation of this alternative.
2. Sheep and lambs continue to be lost to coyotes, despite the more intensive herding and use of frightening devices.
3. After 6 weeks have passed, the rancher requests assistance from the State-administered animal control program, as in the No Action Alternative. Calling and shooting is undertaken.

	Cost	*Totals*
Direct Cost to APHIS ADC and State-Supervised Programs		
APHIS ADC technical assistance		
- Initial 3-day site survey, followed up by five weekly 3-day visits for moving the frightening devices, advising on the acquisition and management of the guard dogs, monitoring, and evaluation, $128 per day	$ 2,304	
- Employment of a second herder, at a cost of $1,500 per month for 1½ months	2,250	
- Two electronic guards and two propane exploders	1,200	
State-administered direct control		
- Two 5-day site visits for calling and shooting the coyotes	1,280	
Public subtotal		$ 7,034
Direct Cost to Affected Party		
Damage		
- Initial loss of lambs, 2 @ $70	140	
- Subsequent loss of lambs, 2 per week for 6 weeks @ $70 each	840	
Damage control		
- Payment for services provided by APHIS ADC	600	
Cost to Other Ranchers		
Predator control program funds		
- ($72 per day) (18 APHIS ADC days + 10 State days) minus $600	1,416	
Affected Party subtotal		2,996
Total		$ 10,030

Alternative 4. Nonlethal Before Lethal Control Program (Coyote Predation on Sheep Grazed on Public Land, Colorado)

Assumptions

1. Initial control activities are the same as for the nonlethal alternative.
2. Recognition that nonlethal methods will not solve the immediate problem leads to the application of lethal methods by APHIS ADC, at the request of the rancher, as in the Current Program Alternative. The threshold that would trigger the use of lethal methods would be losses exceeding one animal per week.

	Cost	*Totals*
Direct Cost to APHIS ADC and APHIS ADC-Supervised Programs		
APHIS ADC technical assistance		
- Initial 3-day site survey, followed up by five weekly 3-day visits, for moving the frightening devices, advising on the acquisition and management of the guard dogs, monitoring, and evaluation, $128 per day	$ 2,304	
- Employment of a second herder, at a cost of $1,500 per month for 1½ months	2,250	
- Two electronic guards and two propane exploders	1,200	
APHIS ADC direct control		
- Five-day site survey for calling and shooting on three consecutive mornings, and setting M-44 sodium cyanide ejectors, $128 per day	640	
- One 3-day visit for follow up on M-44 ejectors, monitoring, and evaluation, $128 per day	384	
Public subtotal		$ 6,778
Direct Cost to Affected Party		
Damage		
- Initial loss of lambs, 2 @ $70	140	
- Subsequent loss of lambs, 2 per week for 5 weeks @ $70 each	700	
Damage control		
- Payment for services provided by APHIS ADC	600	
Cost to Other Ranchers		
Predator control program funds		
- ($72 per day) (26 days) minus $600	1,272	
Affected Party subtotal		2,712
Total		$ 9,490

Alternative 5. Damage Compensation Program (Coyote Predation on Sheep Grazed on Public Land, Colorado)

Assumptions

1. Compensation is for damages verified.
2. Average losses of one lamb per day are expected when control measures are not undertaken.
3. The rancher hires a private trapper or hunter when he realizes that the value of his unverified losses will exceed the cost of control. Until that time, no serious attempt at controlling losses is assumed.
4. It is assumed that producer-funded State and County cooperative agreements would help pay for the compensation surveys in the same manner as they currently contribute to predator control.

	Cost	*Total*
Direct Cost to APHIS ADC and APHIS ADC-Supervised Programs		
- Weekly 3-day compensation surveys, $128 per day for 6 weeks	$ 2,304[6]	
Compensation for damages		
- Loss of 21 lambs over a 6-week period, $70 per lamb	1,470	
Public subtotal		$ 3,774
Direct Cost to Affected Party		
Damage		
- Unverified losses of 21 lambs over a 6-week period, $70 per lamb	1,470	
Damage control		
- Payment for compensation surveys provided by APHIS ADC	600	
- Hiring of help to trap or shoot the coyotes	500	
Cost to Other Ranchers		
Predator compensation program funds		
- ($72 per day) (18 days) minus $600	696	
Affected Party subtotal		3,266
Total		$ 7,040

6 Verification of losses on the open range would be very time-consuming. Site visits longer than 1 day per week (a 3-day trip) might well be warranted.

Example 2. Coyote Predation on Sheep Grazed on Private Land, Virginia

Alternative 1. No Action

Assumptions

1. The rancher is on his own in assessing the problem. He decides to improve his fencing and to hire a private trapper.
2. The trapper takes 4 weeks, working 7 days a week at $100 per day, to remove the coyotes.

	Cost	*Totals*
Direct Cost to Public-Administered Programs		
	None[7]	
Direct Cost to Affected Party		
Damage		
- Loss to coyotes of 2 calves and 22 lambs before the private trapper is hired	$ 2,120[8]	
- Loss of 1 more calf and 8 more lambs after the private trapper is hired	880[9]	
Damage control		
- Hiring of a private trapper	2,800	
- Improvement of fencing	2,485[10]	
Affected Party subtotal		$ 8,285
Total		$ 8,285

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7 No State program is assumed to exist, since there was not a wildlife damage program in Virginia before producers requested formation of the current Cooperative Agreement.

8 Lambs are valued at $60, and calves at $400.

9 Lamb losses: week 1, 2; week 2, 3; week 3, 2; week 4, 1.

10 The cost of improved fencing is based on the following:

Materials	$2.25 per foot × 160 feet	$1,485
Labor	$10 per hour × 40 hours	400
	$ 7 per hour × 40 hours	280
Tractor	$ 8 per hour × 40 hours	320
Total		$2,485

Alternative 2. Current Program (Coyote Predation on Sheep Grazed on Private Land, Virginia)

	Cost	Totals
Direct Cost to APHIS ADC and APHIS ADC-Supervised Programs		
APHIS ADC technical assistance and direct control		
- Initial and subsequent site visits for advising on: improvement of pasture fencing, and use of electronic guard strobe siren devices.	$ 300	
- Four site visits for calling and shooting, neck snaring of coyotes, and evaluation	1,200	
Public subtotal		$ 1,500
Direct Cost to Affected Party		
Damage		
- Loss to coyotes of 2 calves and 22 lambs verified before technical assistance and controls are begun	2,120	
- Loss of 6 more lambs following initiation of technical assistance and controls	360[11]	
Damage control		
- Improvement of fencing	2,485	
- Purchase and use of two strobe siren devices	530	
Affected Party subtotal		5,495
Total		$ 6,995

11 Lamb losses: week 1, 1; week 2, 2; week 3, 2; week 4, 1.

Alternative 3. Nonlethal Control Program (Coyote Predation on Sheep Grazed on Private Land, Virginia)

Variation 1: Nonlethal methods are successful

Assumptions

1. Appropriate nonlethal methods considered and estimated costs:
   (i) Improvement of pasture fencing, $2,485.
   (ii) Acquisition and use of a guard dog, $1,000.
   (iii) Acquisition of two strobe siren devices, $530.
2. All three of the methods are applied.
3. The additional time required for the nonlethal methods to be successful results in additional livestock losses.

	Cost	*Totals*
Direct Cost to APHIS ADC and APHIS ADC-Supervised Programs		
APHIS ADC technical assistance		
- Initial and subsequent site surveys for advising on: improvement of pasture fencing, acquisition and management of a guard dog, and use of electronic guard strobe siren devices; and evaluation	$ 300	
Public subtotal		$ 300
Direct Cost to Affected Party		
Damage		
- Loss to coyotes of 2 calves and 22 lambs verified before technical assistance is begun	2,120	
- Loss of 1 more calf and 19 more lambs following initiation of technical assistance	1,540[12]	
Damage control		
- Improvement of fencing	2,485	
- Purchase and maintenance of one guard dog	1,000[13]	
- Purchase and use of two strobe siren devices	530	
Affected Party subtotal		7,675
Total		$ 7,975

12 Lamb losses: week 1, 2; week 2, 3; week 3, 3; week 4, 4; week 5, 3; week 6, 2; week 7, 1; and week 8, 1.

13 In the Current Program Alternative, a guard dog is not acquired. But in the Nonlethal Control Program and Nonlethal Before Lethal Control Program alternatives, a trained guard dog is assumed to be purchased at a cost of $700 (plus $300 per year maintenance costs).

Alternative 3. Nonlethal Control Program (Coyote Predation on Sheep Grazed on Private Land, Virginia)

Variation 2: Nonlethal methods are not successful

Assumptions:

1. The same decision process is followed as in the first variation of this alternative.
2. The nonlethal methods are not successful. Livestock continues to be lost.
3. After 3 weeks have passed, the rancher hires a private trapper, as in the No Action Alternative.

	Cost	*Totals*
Direct Cost to APHIS ADC and APHIS ADC-Supervised Programs		
APHIS ADC technical assistance		
- Initial and subsequent site surveys for advising on: improvement of pasture fencing, acquisition and management of a guard dog, and use of electronic guard strobe siren devices; and evaluation	$ 300	
Public subtotal		$ 300
Direct Cost to Affected Party		
Damage		
- Loss to coyotes of 2 calves and 22 lambs verified before technical assistance is begun	2,120	
- Losses of 1 more calf and 18 more lambs following initiation of technical assistance	1,480[14]	
Damage control		
- Improvement of fencing	2,485	
- Purchase and maintenance of one guard dog	1,000	
- Hiring of a private trapper	2,800	
- Purchase and use of two strobe siren devices	530	
Affected Party subtotal		10,415
Total		$ 10,715

14 Lamb losses: week 1, 2; week 2, 3; week 3, 3; week 4, 4; week 5, 3; week 6, 2; and week 7, 1.

Alternative 4. Nonlethal Before Lethal Control Program (Coyote Predation on Sheep Grazed on Private Land, Virginia)

Assumptions:

1. Initial control activities are the same as for the nonlethal alternative.
2. Recognition that nonlethal methods will not resolve the problem leads to the application of lethal methods by APHIS ADC, at the request of the rancher, as in the Current Program Alternative. The use of lethal methods is triggered by losses exceeding one animal per week, which occurs in the second week.

	Cost	*Totals*
Direct Cost to APHIS ADC and APHIS ADC-Supervised Programs		
APHIS ADC technical assistance		
- Initial and subsequent site surveys for advising on: improvement of pasture fencing, acquisition and management of a guard dog, and use of electronic guard strobe siren devices; and evaluation	$ 300	
APHIS ADC direct control		
- Six site visits, for calling and shooting, neck snaring of coyotes, and evaluation	1,800	
Public subtotal		$ 2,100
Direct Cost to Affected Party		
Damage		
- Loss to coyotes of 2 calves and 22 lambs verified before technical assistance is begun	2,120	
- Losses of 1 more calf and 10 more lambs following initiation of technical assistance	1,000[15]	
Damage control		
- Improvement of fencing	2,485	
- Purchase and maintenance of one guard dog	1,000	
- Purchase and use of two strobe siren devices	530	
Affected Party subtotal		7,135
Total		$ 9,235

15 Lamb losses: week 1, 1; week 2, 2; week 3, 3; week 4, 2; week 5, 1; and week 6, 1.

Alternative 5. Damage Compensation Program (Coyote Predation on Sheep Grazed on Private Land, Virginia)

Assumptions:

1. Compensation is for damages verified.
2. The rancher hires a private trapper or hunter when he realizes that the value of his unverified losses will exceed the cost of control. Until that time, no serious attempt at controlling losses is assumed.

	Cost	*Totals*
Direct Cost to APHIS ADC and APHIS ADC-Supervised Programs		
- Three compensation surveys per week for 12 weeks, 4 hours per survey ($180 per survey)	$ 6,480	
Compensation for damages		
- Losses per week of 2 ewes, 6 lambs, and 0.5 calves, for 12 weeks, at $110 per ewe, $60 per lamb, and $400 per calf	9,360[16]	
Public subtotal		$ 15,840
Direct Cost to Affected Party		
Damage		
- Unverified losses per week of 0.5 ewes, 4 lambs, and 0.25 calves, for 8 weeks	3,160[17]	
Damage control		
- Hiring of a private trapper	2,800	
Affected Party subtotal		5,960
Total		$ 21,800

16 Verified losses for which the rancher is compensated continue during the 4 weeks of trapping.

17 Unverified losses are suffered for 8 weeks before a trapper is hired.

Example 3. Cattle Egret Rookery that Poses Public Health and Safety Risks in a Residential Area, Texas

Alternative 1. No Action

Assumptions:

1. The community (health department, private landowner and local officials) is on its own in assessing the problem and carrying out damage control activities.
2. The health department requires the landowner to thin the vegetation on the lot, after the young egrets have fledged.

	Cost	*Totals*
Direct Cost to the Community		
- Technical assistance by the health department advising of the landowner on the thinning of vegetation and destroying of nests	$ 300[18]	
Public subtotal		$ 300
Direct Cost to Affected Parties[19]		
Damage		
- Noise and odor nuisance. Potential public health risks.	Not valued[20]	
Damage control		
- Thinning of cover for the entire woodlot	1,000	
Affected Party subtotal		1,000
Total		$ 1,300

18 The health department would probably contact the State Wildlife Service in advising the landowner on removal of the rookery.

19 Thinning of the rookery was paid for by the landowner. Nuisance and health risks were borne by the nearby households.

20 No permanent damage was incurred. However, affected households were bothered by feathers and droppings on porches and door screens that created a nuisance and required additional cleaning.

Alternative 2. Current Program (Cattle Egret Rookery that Poses Public Health and Safety Risks in a Residential Area, Texas)

	Cost	Totals
Direct Cost to APHIS ADC and APHIS ADC-Supervised Programs		
APHIS ADC technical assistance		
- Initial site survey	$ 50	
- Subsequent site visits, for advising on the control strategy, and monitoring and evaluation	250[21]	
Public subtotal		$ 300
Direct Cost to Affected Parties		
Damage		
- Noise and odor nuisance. Potential public health risks.	Not valued	
Damage control		
- Thinning of cover for the entire woodlot	1,000	
Affected Party subtotal		1,000
Total		$ 1,300

Alternative 3. Nonlethal Control Program (Cattle Egret Rookery that Poses Public Health and Safety Risks in a Residential Area, Texas)

The course of action and outcome for this alternative are the same as for the Current Program Alternative.

Alternative 4. Nonlethal Before Lethal Control Program (Cattle Egret Rookery that Poses Public Health and Safety Risks in a Residential Area, Texas)

Since the problem was successfully resolved using nonlethal means, the course of action and outcome for this alternative are the same as for the Current Program Alternative.

Alternative 5. Damage Compensation Program (Cattle Egret Rookery that Poses Public Health and Safety Risks in a Residential Area, Texas)

Compensation would not be applicable in this nonagricultural situation.

21 Use of frightening devices was considered a practical control method for the future. Only habitat modification (thinning of cover) was relied upon to resolve the immediate problem.

Example 4. Cattle Egret Rookery that Poses Public Health and Safety Risks in an Airport, Arkansas

Alternative 1. No Action

Assumptions:

1. The airport is on its own in assessing the problem and carrying out damage control activities.
2. A private firm is hired to advise on the removal of the birds.
3. The private firm advises a course of action similar to that proposed by APHIS ADC in the Current Program Alternative.

	Cost	*Totals*
Direct Cost to Public-administered Programs		
	None	
Direct Cost to Affected Party[22]		
Damage		
- Minor damage to air carrier struck by egrets	$ 25,000	
Damage control		
- Hiring of a private firm to advise on removal of the rookery	40,000	
- Purchase of frightening devices (10 propane exploders at $350 each)	3,500	
- Use of frightening devices	1,000	
- Removal of birds, destruction of nests, and thinning of vegetation	10,000	
Affected Party subtotal		$ 79,500
Total		$ 79,500

22 The aim of the damage control effort is to reduce the risk of future air collisions to the minimal level practical. The risk to aircraft has a value that is not included in the comparison of alternatives.

Alternative 2. Current Program (Cattle Egret Rookery that Poses Public Health and Safety Risks in an Airport, Arkansas)

	Cost	Totals
Direct Cost to APHIS ADC and APHIS ADC-Supervised Programs		
APHIS ADC technical assistance		
- Initial site survey	$ 200	
- Two subsequent site visits, for advising on the control strategy; loan of frightening devices; instructing in the use of frightening devices and removal of birds, nests, and rookery vegetation; and monitoring and evaluation	500	
Public subtotal		$ 700
Direct Cost to Affected Party		
Damage		
- Minor damage to air carrier struck by egrets	25,000	
Damage control		
- Use of frightening devices	1,000	
- Removal of birds, destruction of nests, and thinning of vegetation	10,000	
Affected Party subtotal		36,000
Total		$ 36,700

Alternative 3. Nonlethal Control Program (Cattle Egret Rookery that Poses Public Health and Safety Risks in an Airport, Arkansas)

Variation 1: Nonlethal methods are successful

Assumptions:

1. A combination of harassment and rookery thinning is considered an appropriate nonlethal method for resolving this problem.
2. Birds are scared from the site before or after the nesting season, and the area is cleared of all heavy cover to prevent reestablishment of the rookery (habitat destruction only).

	Cost	Totals
Direct Cost to APHIS ADC and APHIS ADC-Supervised Programs		
APHIS ADC technical assistance		
- Initial site survey	$ 200	
- Two subsequent site visits, for advising on the control strategy; instructing in the use of frightening devices and removal of rookery vegetation; and monitoring and evaluation	500	
Public subtotal		$ 700
Direct Cost to Affected Party		
Damage		
- Minor damage to air carrier struck by egrets	25,000	
Damage control		
- Purchase of frightening devices (2-month supply)	19,000	
- Extended use of frightening devices (5 person-months)	8,500	
- Removal of vegetation before or after nesting season, to prevent reestablishment of the rookery	10,000[23]	
Affected Party subtotal		62,500
Total		$ 63,200

Alternative 3. Nonlethal Control Program (Cattle Egret Rookery that Poses Public Health and Safety Risks in an Airport, Arkansas)

Variation 2: Nonlethal methods are not successful

For this example, there is no reason to believe that nonlethal methods would not be successful, if the additional risk associated with waiting until the end of the nesting season before thinning of the vegetation were acceptable.

23 Postponement of the thinning would allow existing air collision risks to persist.

Alternative 4. Nonlethal Before Lethal Control Program (Cattle Egret Rookery that Poses Public Health and Safety Risks in an Airport, Arkansas)

Assumptions:

1. Initial control activities are the same as for the nonlethal alternative.
2. After applying nonlethal methods for 1 month, a combination of lethal and nonlethal methods are implemented, as in the Current Program Alternative.

	Cost	*Totals*
Direct Cost to APHIS ADC and APHIS ADC-Supervised Programs		
APHIS ADC technical assistance		
- Initial site survey	$ 200	
- One site visit, for advising on the nonlethal control strategy and instructing in the use of frightening devices	200	
- One site visit to advise on the removal of birds, nests, and rookery vegetation; and monitoring and evaluation	300	
Public subtotal		$ 700
Direct Cost to Affected Party		
Damage		
- Minor damage to air carrier struck by egrets	25,000	
Damage control		
- Purchase of frightening devices (1-month supply)	9,500	
- Use of frightening devices (2½ person-months)	4,300	
- Removal of birds, destruction of nests, and thinning of vegetation	10,000	
Affected Party subtotal		48,800
Total		$ 49,500

Alternative 5. Damage Compensation Program (Cattle Egret Rookery that Poses Public Health and Safety Risks in an Airport, Arkansas)

Compensation would not be applicable in this nonagricultural situation.

Example 5. Beaver Flood Damage to Trees and Pasture, Texas

Alternative 1. No Action

Assumptions:

1. The landowner turns to a State-administered wildlife damage control program for assessing the problem and carrying out damage control activities.
2. The State agency advises a course of action similar to that carried out by APHIS ADC under the Current Program Alternative.

	Cost	*Totals*
Direct Cost to State-Administered Program		
Technical assistance and direct control		
- Initial site survey	$ 200	
- Four subsequent site visits for trapping of the beavers, destruction of the dams, and evaluation	800	
Public subtotal		$ 1,000
Direct Cost to Affected Party		
Damage		
- Loss of one cutting (12 bales) of hay and girdled trees	600	
Damage control		
- Payment for lethal removal of the beavers	100	
- Payment for destruction of the dams by explosives, 3 @ $50	150	
Affected Party subtotal		850
Total		$ 1,850

Alternative 2. Current Program (Beaver Flood Damage to Trees and Pasture, Texas)

	Cost	Totals
Direct Cost to APHIS ADC and APHIS ADC-Supervised Programs		
APHIS ADC technical assistance and direct control		
- Initial site survey	$ 200	
- Four subsequent site visits, for trapping of the beavers, destruction of the dams, and evaluation	800	
Public subtotal		$ 1,000
Direct Cost to Affected Party		
Damage		
- Loss of one cutting (12 bales) of hay and girdled trees	600	
Damage control		
- Payment for lethal removal of the beavers	100	
- Payment for destruction of the dams by explosives, 3 @ $50	150	
Affected Party subtotal		850
Total		$ 1,850

Alternative 3. Nonlethal Control Program (Beaver Flood Damage to Trees and Pasture, Texas)

Variation 1: Nonlethal methods are successful

Assumptions:

1. Appropriate nonlethal methods considered and estimated costs:
   (i) Daily removal of the rebuilt dams, following their initial destruction, at a cost of $10 per day. There is no way of knowing if this option would succeed, or how many days it would take if it did.
   (ii) Installation of a draw-down flow device, such as pvc pipe or a galvanized culvert. This option would cost about $350. Again, there would be no certainty of its success.
2. Capture and relocation is considered to be the least expensive of the nonlethal methods.
3. The additional time required to capture and remove the beavers results in the loss of a second cutting of hay.

	Cost	*Totals*
Direct Cost to APHIS ADC and APHIS ADC-Supervised Programs		
APHIS ADC technical assistance and direct control		
- Initial site survey	$ 200	
- Eight subsequent site visits, including the capture of the beavers using cage traps, destruction of the dams, and evaluation	1,600[24]	
- Relocation of the captured beavers	100	
Public subtotal		$ 1,900
Direct Cost to Affected Party		
Damage		
- Loss of two hay cuttings and girdled trees	1,200	
Damage control		
- Payment for trapping and relocation of the beavers	200	
- Payment for destruction of the dams by explosives, 3 @ $50	150	
Affected Party subtotal		1,550
Total		$ 3,450

24 This estimation is made in recognition of the greater time and more costly equipment that would be required for relocation, compared to normal trapping.

Alternative 3. Nonlethal Control Program (Beaver Flood Damage to Trees and Pasture, Texas)

Variation 2: Nonlethal methods are not successful

Assumptions:

1. The same decision process is followed as in the first variation of this alternative.
2. Not all of the beavers are captured and therefore the problem is only temporarily alleviated by nonlethal means.
3. The landowner hires a private trapper to eliminate the remaining beavers.

	Cost	Totals
Direct Cost to APHIS ADC and APHIS ADC-Supervised Programs		
APHIS ADC technical assistance and direct control		
- Initial site survey	$ 200	
- Eight subsequent site visits, including the capture of most of the beavers using cage traps, destruction of the initial and rebuilt dams, and evaluation	1,600	
- Relocation of the captured beavers	50	
Public subtotal		$ 1,850
Direct Cost to Affected Party		
Damage		
- Loss of two hay cuttings and girdled trees	1,200	
Damage control		
- Payment for initial destruction of the dams by explosives, 3 @ $50	150	
- Shooting or trapping of the remaining beavers by a private trapper	150[25]	
- Destruction of the rebuilt dams, by hand	50	
Affected Party subtotal		1,550
Total		$ 3,400

25 It is the landowner's decision (with the loss of two hay cuttings) to proceed to lethal methods by hiring a private trapper. It is also conceivable that the assistance of a State-administered program that included lethal methods of damage control might be called upon by the landowner.

Alternative 4. Nonlethal Before Lethal Control Program (Beaver Flood Damage to Trees and Pasture, Texas)

Assumptions:

1. Initial control activities are the same as for the nonlethal alternative.
2. Failure to capture and relocate all the beavers in a month leads to the application of lethal methods by APHIS ADC, at the request of the landowner (as in the Current Program Alternative).

	Cost	*Totals*
Direct Cost to APHIS ADC and APHIS ADC-Supervised Programs		
APHIS ADC technical assistance and direct control		
- Initial site survey	$ 200	
- Six subsequent site visits, including capture and relocation of some of the beavers, shooting or trapping of the remaining beavers, destruction of the initial dams, and evaluation	1,200	
Public subtotal		$ 1,400
Direct Cost to Affected Party		
Damage		
- Loss of one hay cutting and girdled trees	600	
Damage control		
- Payment for nonlethal and lethal trapping	150	
- Payment for initial destruction of the dams by explosives, 3 @ $50	150	
- Destruction of the rebuilt dams, by hand	50	
Affected Party subtotal		950
Total		$ 2,350

N Appendix

Alternative 5. Damage Compensation Program (Beaver Flood Damage to Trees and Pasture, Texas)

Assumptions:

1. Compensation would be for damages verified.
2. The landowner would attempt to shoot or trap the beavers, turning to hired help in order to remove remaining ones. The dams would be destroyed using a backhoe. Rebuilt dams would be destroyed by hand.

	Cost	*Totals*
Direct Cost to APHIS ADC and APHIS ADC-Supervised Programs		
- Two compensation surveys	$ 100	
Compensation for damages		
- Loss of two cuttings of hay and girdled trees	1,200	
Public subtotal		$ 1,300
Direct Cost to Affected Party[26]		
Damage control		
- Shooting or trapping of some of the beavers by the landowner, including the cost of the traps	80	
- Destruction of the initial dams, by backhoe	300	
- Shooting or trapping of the remaining beavers by the private trapper	150	
- Destruction of the rebuilt dams, by hand	50	
Affected Party subtotal		580
Total		$ 1,880

26 If nothing is done to remove the beaver dams, timber valued at more than $3,600 would be lost due to the flooding. How much time would pass before this potential loss would be realized depends upon the weather. In drier years, the trees could survive much longer than in wetter years.

Example 6. Beaver Girdling Damage to Trees, Texas

Alternative 1. No Action

Assumptions:

1. The university is on its own in assessing the problem and carrying out damage control activities.
2. The university calls upon its own specialists in the fields of wildlife biology and damage control.
3. The specialists advise a course of action like that proposed by APHIS ADC. Costs are the same as in the Current Program Alternative, except no payments are made to APHIS ADC. Imputed costs of the specialists' time would be little different from estimated APHIS ADC costs under the Current Program Alternative.

	Cost	*Totals*
Direct Cost to Public-Administered Programs		
	None	
Direct Cost to Affected Party		
Damage		
- Loss of five girdled young trees	$ 200[27]	
Damage control		
- Imputed costs of university specialists	100	
- Acquisition and placement of tree protectors	200[28]	
Affected Party subtotal		$ 500
Total		$ 500

27 Because the damage to the trees was noticed before it became extensive, a minimal number was lost. The value of the lost trees is based on replacement and planting costs.

28 Placement of tree protectors was an appropriate response, since there was only a limited number of trees threatened.

Alternative 2. Current Program (Beaver Girdling Damage to Trees, Texas)

	Cost	Totals
Direct Cost to APHIS ADC and APHIS ADC-Supervised Programs		
APHIS ADC technical assistance		
- Initial site survey	$ 50[29]	
- One subsequent site visit, for advising on the application of tree protectors, and evaluation	50	
Public subtotal		$ 100
Direct Cost to Affected Party		
Damage		
- Loss of five girdled young trees	200	
Damage control		
- Acquisition and placement of tree protectors	200	
Affected Party subtotal		400
Total		$ 500

Alternative 3. Nonlethal Control Program (Beaver Girdling Damage to Trees, Texas)

The course of action and outcome for this alternative are the same as for the Current Program alternative.

Alternative 4. Nonlethal Before Lethal Control Program (Beaver Girdling Damage to Trees, Texas)

Since the problem was successfully resolved using nonlethal means, the course of action and outcome for this alternative are the same as for the Current Program Alternative.

Alternative 5. Damage Compensation Program (Beaver Girdling Damage to Trees, Texas)

Compensation would not be applicable in this nonagricultural situation. The trees are part of an ornamental landscape, not an agricultural resource. Control measures would likely be initiated as in the No Action Alternative.

29 The cost of site surveys, as in the other examples, depends on the type of damage being assessed, the distance traveled by the APHIS ADC officer, other requests for assistance in the vicinity, and a number of other factors. In this instance, the cost of site visits was minimal, since the location was not far from an APHIS ADC office and the damage could be readily examined.

Example 7. Blackbirds Roost that Poses Public Health and Safety Risks to a School, Kentucky

Alternative 1. No Action

Assumptions:

1. The health department and community are on their own in assessing the problem and carrying out damage control activities.
2. A private firm, hired to evaluate the problem, advises that first the birds should be scared away, and then trees should be removed to prevent the roost from reforming (same as the Current Program Alternative solution).

	Cost	*Totals*
Direct Cost to Public-Administered Programs		
	None	
Direct Cost to Affected Parties		
Damage		
- Children and adults ill from histoplasmosis associated with the blackbird roost	$ 700[30]	
Damage control		
- Hiring of a private firm for evaluation of the problem (4 days at $200 per day)	800	
- Purchase of scaring devices	6,000[31]	
- Application of scaring devices (eight persons for 40 hours @ $10 per hour)	3,200	
- Thinning and removal of trees	1,400	
Affected Party subtotal		$ 12,100
Total		$ 12,100

30 The cost of histoplasmosis presented in this example is only the cost of diagnosis ($100 per person) for seven people. In a more comprehensive analysis, other associated expenses would be included, such as medical and hospital expenditures and income forgone due to illness. However, this entry is constant for the various alternatives (the illnesses having occurred before controls are initiated), and therefore the relative cost effectiveness of the alternatives is not influenced by the value used.

31 The scaring devices purchased include the following:

Ammunition (4,000 rounds) and eight launchers	$1,800
Eight propane cannons	1,600
Distress tapes and four electronic devices	2,500
Balloons	100
Total	$6,000

Alternative 2. Current Program (Blackbirds Roost that Poses Public Health and Safety Risks to a School, Kentucky)

	Cost	*Totals*
Direct Cost to APHIS ADC and APHIS ADC-Supervised Programs		
APHIS ADC technical assistance		
- Initial and subsequent site visits, for advising on the control strategy, lending of scaring devices, supervision of operations, and monitoring and evaluation	$ 1,100	
Public subtotal		$ 1,100
Direct Cost to Affected Parties		
Damage		
- Children and adults ill from histoplasmosis associated with the blackbird roost	700	
Damage control		
- Application of scaring devices (8 persons for 40 hours @ $10 per hour)	3,200	
- Thinning and removal of trees ($100 per acre)	1,400	
Affected Party subtotal		5,300
Total		$ 6,400

Alternative 3. Nonlethal Control Program (Blackbirds Roost that Poses Public Health and Safety Risks to a School, Kentucky)

The course of action and outcome for this alternative are the same as for the Current Program Alternative.

Alternative 4. Nonlethal Before Lethal Control Program (Blackbirds Roost that Poses Public Health and Safety Risks to a School, Kentucky)

Since the problem was successfully resolved using nonlethal means, the course of action and outcome for this alternative are the same as for the Current Program Alternative.

Alternative 5. Damage Compensation Program (Blackbirds Roost that Poses Public Health and Safety Risks to a School, Kentucky)

Compensation would not be applicable in this nonagricultural situation.

Example 8. European Starling Forage Loss and Health Risks to Livestock and Farm Workers at a Dairy Farm, Vermont

Alternative 1. No Action

Assumptions:

1. The farmer is on his own in assessing the problem and carrying out damage control activities.
2. Feed losses and health risks compel the farmer to hire help to remove the birds.
3. The farmer relies on harassment and shooting to control losses, with limited success. Forage losses and potential health risks are lower than they would be otherwise (forage by 20 percent), but they are not eliminated.

	Cost	*Totals*
Direct Cost to Public-Administered Programs		
	None	
Direct Cost to Affected Party		
Damage[32]		
- Feed consumed by the birds (0.8 × $2,090)		$ 1,670[33,34]
Damage control		
- Harassment and shooting by the farmer and hired help ($10 per hour, 2 hours per day, 30 days)	600	
Affected Party subtotal		$ 2,270
Total		$ 2,270

32 Potential health risks to livestock and farm workers have not been valued, but their cost could easily exceed that of lost forage. Testing for avian tuberculosis could cost as much as $200, for the veterinarian's time and the test itself. If tests for the disease were positive, lost income because of quarantine regulations and prohibited milk sales would be considerable.

33 The value of feed consumed by the birds is conservatively based on year-round grain consumption rates, even though consumption rates during winter months, when forage loss is most likely to occur, are greater (45 grams per day per bird for a grain-only diet, compared to 14 grams per day for a mixed diet). Based on flock populations of 1,000 birds in the 6 coldest months and 500 birds in the 6 warmest months, and a grain price of $10 per 100 pounds, annual forage losses would be approximately $2,090.
It is likely that the farmer might experience some summer losses, but might not fully realized the extent of ongoing damage until the heavier losses occur during the winter months.

34 For none of the alternatives can the feed losses and health risks be considered to be completely resolved. However, the relative success of the various methods can be approximated by the percentage reduction in the bird population. The Current Program Alternative is the most successful, reducing the population to 20 percent of what it would be with no controls. In contrast, the No Action Alternative is assumed to only reduce the population to 80 percent of what it would otherwise be, and the yearly loss would be about $1,670 (0.8 × $2,090).

Alternative 2. Current Program (European Starling Forage Loss and Health Risks to Livestock and Farm Workers at a Dairy Farm, Vermont)

	Cost	Totals
Direct Cost to APHIS ADC and APHIS ADC-Supervised Programs		
APHIS ADC technical assistance and direct control		
- Initial site survey and subsequent visits for advising on the control strategy, pre-baiting, disposal of dead birds and unused bait, and monitoring and evaluation	$ 150[35]	
Public subtotal		$ 150
Direct Cost to Affected Party		
Damage		
- Feed consumed by the birds (0.2 × $2,090)	420	
Damage control		
- Payments for services provided by APHIS ADC	350	
- Installation of 0.5 inch hardware cloth	500[36]	
Affected Party subtotal		1,270
Total		$ 1,420

35 In the Current Program Alternative, an estimated 4-week period would be required to resolve the problem: 2 weeks for obtaining a permit to apply the pesticide, 12 days for pre-baiting, and 2 days for treatment.

36 Hardware cloth is purchased and installed as a means of exclosure. It is purchased for about $340 (630 square feet @ $54 per square foot), and installation requires $160 (16 hours @ $10 per hour), for a total cost of $500. Exclosure would not be a successful control method by itself. Given the open design of modern dairies, it would not be possible to completely prevent birds from feeding on the forage simply by using hardware cloth.

Alternative 3. Nonlethal Control Program (European Starling Forage Loss and Health Risks to Livestock and Farm Workers at a Dairy Farm, Vermont)

Variation 1: Nonlethal methods are successful

Assumptions:

1. Appropriate nonlethal methods considered and estimated costs:
   (i) Exclosure, material and labor, $500.
   (ii) Eye balloons, 10 @ $9 each and 4 hours of labor @ $10 per hour.
   (iii) Distress tapes and equipment, $140 and 4 hours of labor @ $10 per hour.
   (iv) Pyrotechnics, 60 boxes of shells @ $25 per box, and 2 hours per day labor for 30 days @ $10 per hour.
2. A combination of the four methods is used. First the hardware cloth is applied. Eye balloons are installed in the barn and distress tapes are set near the entrances. Lastly, the pyrotechnics are used. When first applied, the methods reduce bird numbers to 30 percent of the uncontrolled population, but their numbers then increase to 80 percent. An overall reduction to 70 percent of the uncontrolled population is assumed.

	Cost	*Totals*
Direct Cost to APHIS ADC and APHIS ADC-Supervised Programs		
APHIS ADC technical assistance and direct control		
- Initial site survey and subsequent visits for implementation of the nonlethal methods, and monitoring and evaluation	$ 720	
Public subtotal		$ 720
Direct Cost to Affected Party		
Damage		
- Feed consumed by the birds (0.7 × $2,090)	1,460	
Damage control		
- Payments for services provided by APHIS ADC	1,690	
- Installation of 0.5-inch hardware cloth	500	
Affected Party subtotal		3,650
Total		$ 4,370

Alternative 3. Nonlethal Control Program (European Starling Forage Loss and Health Risks to Livestock and Farm Workers at a Dairy Farm, Vermont)

Variation 2: Nonlethal methods are not successful

Assuming nonlethal methods would not be successful is not meaningful in this instance, since for none of the alternatives is the problem resolved.

Alternative 4. Nonlethal Before Lethal Control Program (European Starling Forage Loss and Health Risks to Livestock and Farm Workers at a Dairy Farm, Vermont)

Assumptions:

1. Initial control activities are the same as for the nonlethal alternative.
2. Recognition that nonlethal methods are not sufficiently effective leads to the application of lethal methods by APHIS ADC, as in the Current Program Alternative. The threshold that triggers the use of lethal methods is a continuing bird population of 80 percent or greater of the uncontrolled population, after 1 month of nonlethal controls.

	Cost	*Totals*
Direct Cost to APHIS ADC and APHIS ADC-Supervised Programs		
APHIS ADC technical assistance and direct control		
- Initial site survey and subsequent site visits, for advising on and conducting the nonlethal control methods, and monitoring and evaluation	$ 720	
- Pre-baiting, disposal of dead birds and unused bait, and monitoring and evaluation	150	
Public subtotal		$ 870
Direct Cost to Affected Party		
Damage		
- Feed consumed by the birds after grain baiting (0.2 × $2,090)	420	
Damage control		
- Payments for services provided by APHIS ADC	2,040	
- Installation of 0.5-inch hardware cloth	500	
Affected Party subtotal		2,960
Total		$ 3,830

Alternative 5. Damage Compensation Program (European Starling Forage Loss and Health Risks to Livestock and Farm Workers at a Dairy Farm, Vermont)

Assumptions:

1. Compensation is for damages verified. Verification visits are made in the winter and summer, with payments based on grain consumption estimates.
2. A yearly compensation payment of $2,090 is assumed in this example.

	Cost	*Totals*
Direct Cost to APHIS ADC and APHIS ADC-Supervised Programs		
- Two compensation surveys, twice a year	$ 300	
Compensation for verified damages		
- Feed consumed by the birds	2,090	
Public subtotal		$ 2,390
Direct Cost to Affected Party	None	
Total		$ 2,390

Example 9. Gull Management to Protect Endangered Piping Plovers, New York

Alternative 1. No Action

The National Park Service would be obligated by the Endangered Species Act to carry out a damage control program similar to that conducted by APHIS ADC. The cost could be expected to be the same or more than that of the Current Program Alternative.

Alternative 2. Current Program (Gull Management to Protect Endangered Piping Plovers, New York)

	Cost	*Totals*
Direct Cost to the National Park Service[37]		
APHIS ADC technical assistance and direct control		
- Initial and subsequent site visits for advising on gull management strategies, conducting harassment activities, addling of eggs, and monitoring and evaluation	$ 77,900[38]	
Public subtotal		$ 77,900
Total		$ 77,900

Alternative 3. Nonlethal Control Program (Gull Management to Protect Endangered Piping Plovers, New York)

This alternative would not be feasible because long-term harassment would disturb other bird species (terns) that are considered threatened. If long-term harassment were a permitted method of control, the estimated cost of implementation would be between $266,000 and $298,000, given the additional personnel and equipment that would be required.

Alternative 4. Nonlethal Before Lethal Control Program (Gull Management to Protect Endangered Piping Plovers, New York)

This alternative is the same as the Current Program Alternative, because the harassment and addling-of-eggs strategy was a two-phase process.

Alternative 5. Damage Compensation Program (Gull Management to Protect Endangered Piping Plovers, New York)

Compensation would not be applicable in this nonagricultural situation.

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37 APHIS costs were borne by the National Park Service through an interagency agreement.

38 Gull harassment and addling of eggs were effective in greatly reducing the current year's production, but these measures would probably not be successful in the long term. In other words, the threat to the plovers was mitigated, but not resolved.

Appendix O

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